

**WHEN, WHY AND WHERE
IN ORAL AND
MAXILLOFACIAL SURGERY**

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WHEN, WHY AND WHERE IN ORAL AND MAXILLOFACIAL SURGERY

PREP MANUAL FOR
UNDERGRADUATES AND POSTGRADUATES
PART II

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Dedicated to

My Parents

PREFACE

*God Made Man,
Teacher Made Gentleman*

There are several excellent textbooks available in Oral and Maxillofacial Surgery.

Last moment reading demands maximum information within limited time. *When, Why and Where in Oral and Maxillofacial Surgery (Part II)* provides the basic facts and principles of oral surgery which are necessary for every student.

The book is particularly helpful for postgraduate students.

KC Gupta

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Chapter

1

Growth and Development (Head and Neck Region)

Chapter Outline

- Definition of Growth and Development
- Difference between Growth and Development
- Sex difference in the Skull
- Development of Face
- Development of Tongue
- Development of Mandible
- Development of Maxilla
- Development of Temporomandibular Joint
- Development of Salivary Gland
- Development of Thyroid Gland

DEFINITION OF GROWTH AND DEVELOPMENT

Growth

Craniofacial growth is a complex phenomenon. Growth center is considered an anatomic phenomenon. Growth is quantitative.

For example, it is a measurable aspect of biologic life. Growth is change or difference in quantity.

Development

In simple words, progression towards maturity. Development can be considered as a continuum of casually related events

from the fertilization of ovum onwards. Development is a physiological and behavioral phenomenon.

DIFFERENTIATING BETWEEN GROWTH AND DEVELOPMENT

<i>Growth</i>	<i>Development</i>
Growth is "increase in size"	Development is "progression towards maturity"
It is an anatomic phenomenon	It is a physiological and behavioral phenomenon
It is quantitative	It includes growth + differentiation + translocation
Growth highlights the normal dimensional changes over a period of time	It comprises sequential events from fertilization till death
Growth might cause change in form or proportion. Increase or decrease in size, change in texture or complexity	It includes all the changes in life of a subject from his/her origin as a single cell till death

SEX DIFFERENCE IN THE SKULL

- No sex differences until puberty.
- Post puberty differences are:

<i>Features</i>	<i>Males</i>	<i>Females</i>
Weight	Heavier	Lighter
Size	Larger	Smaller
Walls	Thicker	Thinner
Capacity	Greater	10% less than males
Masculine ridge	More marked	Less marked
Temporal lines	More marked	Less marked
Mastoid process	More marked	Less marked
External occipital protuberance	More marked	Less marked
Tympanic plate	Larger and rough	Smaller and less rough
Supra orbital margin	Rounded	Sharp
Forehead	Sloping	Vertical
Vault	Rounded	Somewhat flattened

Contd...

Contd...

Frontal and parietal tubera	Less prominent	More prominent
Contour of face	Longer, chin is bigger skull is more rough zygomatic bones are more massive	Rounded Facial bones are Smoother Mandible and maxilla are smaller

DEVELOPMENT OF FACE

Introduction

In general two terms which are closely related –

- Development is the progression towards maturity.
- Growth is increase in the size.
Different organs grow at different rate at different time.

Scheme of Development of Face

- Prenatal period – Intrauterine (from fertilization till birth)
 - Pre-embryonic period or period of ovum (from fertilization till 2 or 3 weeks)
 - Embryonic period (from 3rd or 4th week till 8th week)
 - Fetal period (from 9th week till birth)
- Postnatal period (extrauterine)

Key Points

Prenatal Period

- "Pre-embryonic period or period of ovum"
 - This period extends from the fertilization of the ovum to about 3 week
 - During this period, the single cell zygote multiplies rapidly by segmentation
 - Three germ layers ectoderm, endoderm, and mesoderm are formed during this period

Contd...

Contd...

- The ovum is fertilized by spermatoon and a zygote is formed in the fallopian tube.
- B. "Embryonic stage"
 - Rudiments of all organs formed during this period
 - A one-month-old embryo has no face as such.
 - Approximately 1 month after fertilization growth center associated with the development of face, nose, palate and jaws
 - These centers are located around a depression known as stomodeum or primitive face or Rathke's pouch which is lined by ectodermal cells.
- C. "Fetal Period"
 - During the fetal period, the individual facial bones undergo rapid and co-ordinated growth pattern closely associated with the brain, orbit and nasal cavities
 - Rapid growth of the brain and nasal septum to play an important role in facial skeletal development
 - The resorption and deposition at an other surface permits the bones to maintain, their proper association, dimension and morphological appearances during critical growth period.

Postnatal Period

1. Bone formation
2. Growth process
 - a. Displacement
 - b. Remodeling
3. Postnatal age changes in facial growth
4. Growth of the cranial base
5. Growth of mid facial skeleton
6. Growth of mandible
7. Growth of paranasal sinus
 - a. Frontal sinus
 - b. Sphenoid sinus
 - c. Maxillary sinus
 - d. Ethmoid sinus.

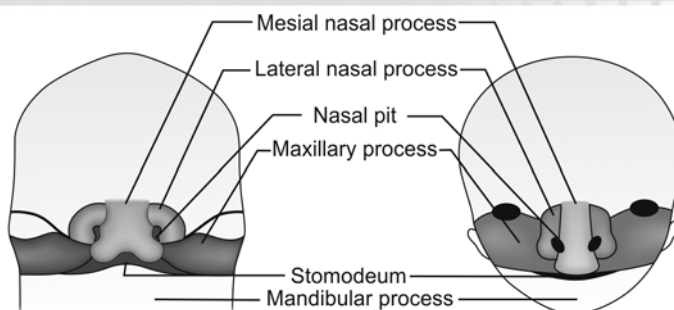


Fig. 1.1: Development of face

Summary of Origin of Different Parts of Mouth and Face

1. Stomodeum–Rathke’s pouch: Anterior pituitary/lip/teeth/hard palate/anterior part of the soft palate.
2. Median nasal process: Premaxilla (2 central incisors)/nasal septum/philtrum/frenum of upper lip.
3. Lateral nasal process: Cribriform plate/lateral mass of ethmoid/inferior nasal concha/upper part of body of maxilla/frontal process/lacrima and other nasal bones/lateral cartilage of nose and part of alar cartilage of nasal septum.
4. Maxillary process: Part of body of maxilla/upper alveolar process/lateral part of premaxilla/hard palate except premaxillary part/zygomatic bone/zygomatic process of temporal bone/upper lip except philtrum.
5. Mandibular process: Body of mandible/lower alveolar process/lower lip/part of cheek.

DEVELOPMENT OF TONGUE

Introduction

Tongue is a major organ because it develops from more than one branchial arches.

Tongue is composed of: Base, body and tip.

It has two surfaces: Dorsal and ventral and two lateral borders.

The dorsal surface of the tongue is divided into anterior 2/3rd and posterior 1/3rd by the sulcus terminalis which is V shaped groove. In the center of the V is the foramen cecum.

Development

1. The tongue arises from the ventral wall of the primitive oropharynx from the lining of the branchial arches.
2. The tongue develops from 1st, 3rd, 4th arches at about 4th week *in utero*. Paired lingual swellings appear in the mesenchyme of the 1st branchial arch.
3. From the 3rd arch behind the lingual swellings arise the tuberculum impar a median swelling.
4. Behind the tuberculum impar is a pit called the foramen caecum that marks the site of origin of the thyroid diverticulum. It extends into the pharynx to form the major portion of the thyroid gland.
5. The lingual swellings grow and fuse with each other and growing over the tuberculum impar to form the anterior 2/3rd of the tongue.
6. Two ventral parts of the 2nd, 3rd and 4th arches fuse to form the copula in the midplane. The posterior portion of the eminence forms the hypobranchial eminence.
7. The circumvallate papillae along the sulcus terminalis form at 2 to 5 months *in utero*. Fungiform papillae develop at the 11 weeks *in utero*.
8. Muscles are derived from the occipital somites and are supplied by the hypoglossal nerve.
9. The tongue grows rapidly at 6-7 weeks *in utero*.
10. The tongue descends to occupy a lower position in the increased oral volume and allows the palatal shelves to elevate.

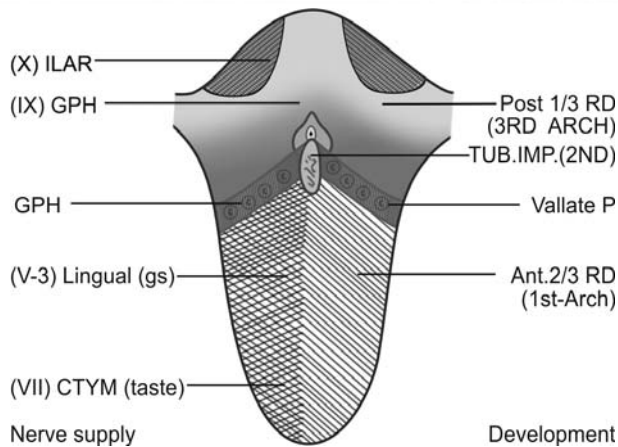


Fig. 1.2: Development of tongue

11. The sensory supply of the anterior 2/3rd of the tongue is by the lingual nerve. Gustation by the chorda tympani nerve and posterior 1/3rd by glossopharyngeal nerve; and posterior most part by vagus nerve.
12. In the infant stage of life, tongue is an important organ because it helps in the process of sucking. The tongue is placed between the gum pad to create an oral seal.
13. The tongue attains adult size at about 8 years of age. The size of the tongue is almost double when the size of the newborn is compared with the adult tongue.

Developmental Anomaly

1. Macroglossia: Abnormally large tongue, commonly seen in hyperpituitarism, clinically crenations on lateral borders of tongue are seen.
2. Microglossia: Smaller tongue.
3. Aglossia: Absence of tongue.

DEVELOPMENT OF MANDIBLE

Introduction

Mandible is derived from the 1st branchial arch which is called the mandibular arch. The branchial arches start developing at about 4th week in utero.

Branchial arches are bilateral mesodermal swellings. The mesodermal core of each arch is surrounded by invasion of the ectomesenchymal tissue that augments it. There are five branchial arches in total. The fifth being transitory. The first arch is the mandibular and second arch is the hyoid arch. The cartilage of the 1st arch is called Meckel's cartilage, developing at about 41st to 45th day *in utero*. The Meckel's cartilage provides a template for the development of mandible.

Development

- The mandible starts its development as a swelling which grows ventromedially to approach the fellow of the opposite side.
- By 5th week of intrauterine life, the mandibular processes of both sides approach each other and are fused.
- The Meckel's cartilage extends from the area of the future ear to the midlines of the fused mandibular processes.
- At about 6th week, the cartilaginous rods begin to chondrify which is continuous from the malleolus region to the future symphysis. The rods are separated in the midline. The rods support the forming skeletal framework of the mandible.
- The part of the mandible mesial to mental foramen undergoes endochondral ossification while the lateral to mental foramen undergoes intramembranous ossification.

- The process of ossification proceeds anteriorly and posteriorly. Posterior intramembranous ossification forms the rest of the body and the ramus of the mandible.

Development of Condyle and Coronoid

- The formation of condylar process starts only at the 10th week, hence, till such time malleus and incus function as a temporary joint with the glenoid fossa of the temporal bone to permit mandibular movements.
- The Meckel's cartilage is replaced largely by bone and remnant of it is left as the bones of malleus and incus. And the soft tissue part as sphenomandibular ligament.
- Ossification center is present at the site of future mental foramen.
- The condylar cartilage is a secondary cartilage and its origin is unrelated to the Meckel's cartilage which is primary cartilage. The condyle arises as a separate mesenchymal condensation that is cone shaped at about 10th week of intrauterine life.
- The process of ossification does not start till 14th week. The cartilage is replaced by bone except the region of the tip of the head of the condyle superior which is maintained till teens for future growth.
- Now that condyle is established the TMJ is shifted anteriorly the ossification of ramus proceeds and the condyle is soon fused to the mandible at about 16th week.
- Coronoid process develops from secondary cartilage that arises at about 10th to 14th week in utero. Soon the growing intramembranous ossification fuses the coronoid process to the ramus.

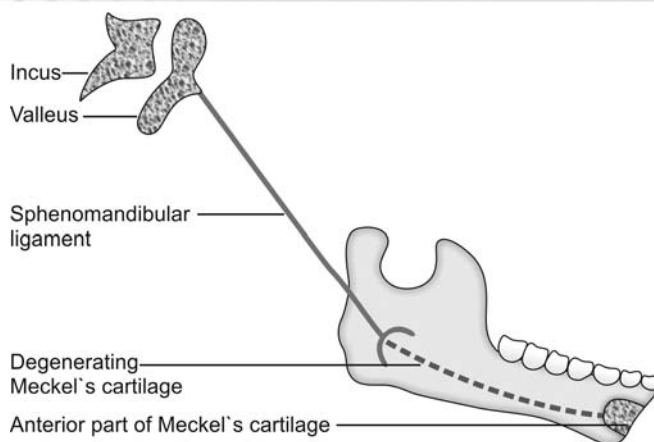
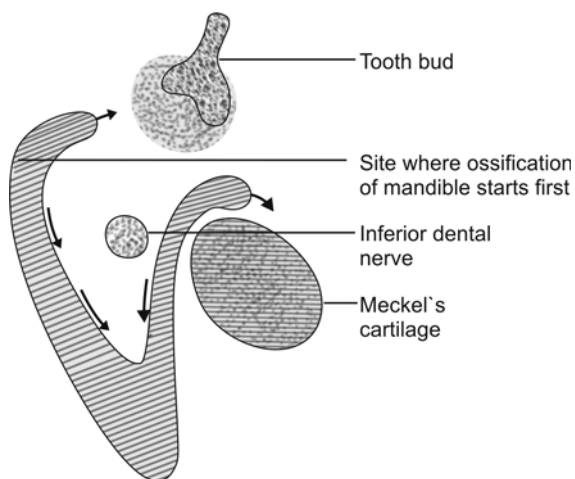


Fig. 1.3: Contribution of Meckel's cartilage



Growing mandible (Coronal section)

Fig. 1.4: Development of mandible

Anomaly

The failure of fusion of both the mandibular process from both side known as midline cleft.

Postnatal Growth of Mandible

Mandible at Birth

- Mandible at birth is much smaller in size.
- There is slight variation in shape from the adult form.
- The infants mandible has a short horizontal ramus with obtuse gonial angle.
- The condyles are low and at the position of the occlusal plane.
- The symphyseal suture has not ossified.

Growth in the First Year

- The growth of mandible in the 1st year of life involves growth at the symphyseal suture.
- Anterior expansion in the anterior region to accommodate the erupting anterior teeth.
- The mental foramen is directed at right angle to the surface of the corpus.
- There is increased deposition in the posterior surface of the ramus of the mandible.
- The infants mandible is suite for the sucking activity. Since the condyle and glenoid fossa is flat which helps in the anteroposterior movement of the mandible.

Mandible in the Adult

- Mandible in the adult is different from the mandible of an infant.
- The ramus is longer.
- The gonial angle is less obtuse.
- The bone is longer on the whole. Condyle is well developed.

DEVELOPMENT OF MAXILLA

Introduction

Maxilla is a pair of bones on either side of the middle- third of the face formed by intramembranous bone formation.

Growth of maxilla closely follows the neurak growth curve in the Scammon's curve.

Development

- By about 4th week of intrauterine life the facial process arises from the 1st arch which corresponds to the mandibular process.
- Later the mandibular processes give two more swellings which grows ventromedially. These are maxillary process.
- The maxillary process grows ventromedially towards the nasal processes.
- The maxillary and the medial nasal processes are initially separated by the epithelial nasal fin which soon degenerates so that, the mesenchyme of the two processes fuse.
- The maxillary and mandibular processes fuse at the sides form the cheek tissue.
- The lateral nasal process forms the alae of the nose.
- The medial nasal process of both sides fuse to form the globular process in the middle which gives rise to the- tip of nose, columella, the philtrum, the labial tuberculum and the entire primary palate.
- The maxillary process forms the alveolus which bears teeth distal to the canines and the secondary palate.
- The area of fusion of the maxillary and mandibular processes forms the commissures or corner of the mouth.
- As the two processes grow towards the fellow of the opposite side and stomodeum is narrowed.

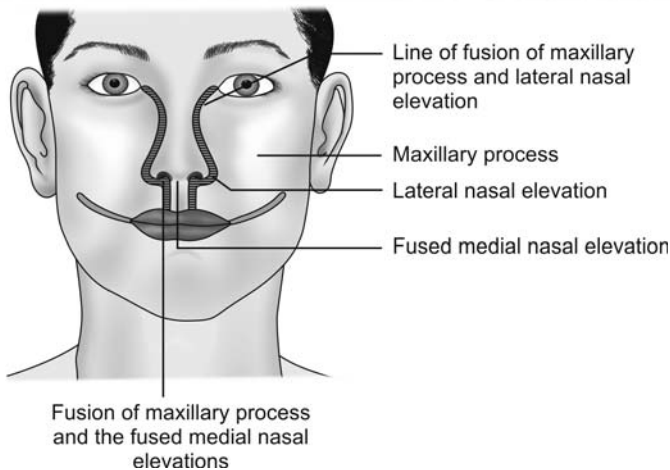


Fig. 1.5: Development of maxilla

Postnatal Growth of Maxilla

- Maxilla is a membranous bone and the development/ growth of maxilla is completed early when compared to the mandible.
- According to the cephalo-caudal gradient of growth-growth does not proceeds proportionately in humans.
- So in the case of maxilla it completes its growth early in life in certain aspects relative to the mandible.
- The maxilla especially width also follows closely the neural growth curve more than the general growth curve in the Scammon's curve.
- The growth of maxilla occurs by the following processes:
 - a. Connective tissue proliferation at the sutures
 - b. Translation
 - c. Remodeling.

DEVELOPMENT OF TEMPOROMANDIBULAR JOINT

- At the 7th week, Meckel's cartilage extends from chin to the base of the skull. This cartilage provides a temporary articulation between mandible and base of the skull.
- This joint is replaced by temporomandibular joint (TMJ) near the end of fetal life.
- Meckel's cartilage persists as incus, malleus, anterior ligament of malleus and sphenomandibular ligament.
- Thus Meckel's cartilage is a very important structure in providing a scaffold for mandible and TMJ, though it does not contribute much directly into their formation.
- Articular disc is one of the first component to be recognizable. The disk seems to be a muscle derivative of first branchial arch.
- There is first a mesenchymal condensation on the upper end of mandibular ramus.
- Anteriorly this mesenchyme extends from superior border of lateral pterygoid muscle to medial side of masseter muscle.
- The lateral pterygoid muscle extends posteriorly between the squama of temporal and mandibular condyle to the malleus and contributes to the formation of medial part of anterior disk.
- Mesenchymal condensation forms the fibrous covering on the joint surface.
- At 12th week mandibular cartilage appears.
- At 13th week the condyle with articular disk come in contact with temporal bone and inferior joint cavities develop followed by superior cavity.
- The disc is first vascular. Later on as the disc is compressed, central and anterior part become avascular.

- The disc loses its connection with malleus and attaches itself to the anterior lip of Glaserian fissure (squamo-tympanic or petrotympanic).
- The synovial lining of the joint cavities appears later.

DEVELOPMENT OF SALIVARY GLAND

- There are three pairs of major and about 500 minor salivary gland in the oral cavity.
- The pattern of origin is similar for all the oral gland. They arise as bands from oral epithelium and grow into the underlying connective tissue.
- The parotid and submandibular bands appear during 6th week and that of sublingual gland appear during the 7th week.
- Minor salivary gland appear later.
- The epithelial bands ramify as solid cord with small terminal enlargement. The acini later, the solid cords are canalized to give rise to duct system. The cells of acini are specialized for secretion.
- The majority of gland are ectodermal in origin. Though some glands at the base of the tongue are ectodermal.
- The connective tissue components and nervous system play an important role in the growth of salivary gland.

DEVELOPMENT OF THYROID GLAND

- The thyroid develops from a “median endodermal thyroid diverticulum”, which grows down in front of the neck from the floor of the primitive pharynx, just caudal to the tuberculum impar.
- The lower end of the diverticulum enlarges to form the gland.
- The rest of the diverticulum remain narrow and is known as the thyroglossal duct. Most of the duct soon disappear.

- The position of the upper end is marked by the foramen cecum of the tongue and in lower end often persists as the pyramidal lobe.
- The gland becomes functional during third month of development.
- Remnants of the thyroglossal duct may form thyroglossal cyst or a thyroglossal fistula.
- Thyroid tissue may develop at abnormal sites along the course of the duct resulting in lingual or retrosternal thyroids.
- Accessory thyroids may be present.

Chapter

2

Surgical Anatomy of Head and Neck Region

Chapter Outline

- Surgical Anatomy of Scalp
- Surgical Anatomy of Skin of Face
- Surgical Anatomy of Temporomandibular Joint
- Surgical Anatomy of Cavernous Sinus
- Surgical Anatomy of Maxillary Sinus
- Surgical Anatomy of Parotid Gland
- Surgical Anatomy of Submandibular Gland
- Surgical Anatomy of Orbit
- Surgical Anatomy of Tongue
- Surgical Anatomy of Trachea
- Surgical Anatomy of Larynx
- Surgical Anatomy of Pharynx
- Surgical Anatomy of Nose
- Surgical Anatomy of Ear
- Surgical Anatomy of Hard Palate
- Surgical Anatomy of Soft Palate
- Surgical Anatomy of Floor of Mouth
- Surgical Anatomy of Mandibular Third Molar
- Surgical Anatomy of Middle Third of Facial Skeleton
- Applied Surgical Anatomy of Mandible
- Surgical Anatomy of Thyroid Gland
- Surgical Anatomy of Parathyroid Gland
- Surgical Anatomy of Deep Structures in the Neck

INTRODUCTION

In general anatomy can be explained under the head of:

- a. Gross anatomy
 - Number
 - Location
 - Size—length/width
 - Shape
 - Weight.
- b. Surgical anatomy- deals with the anatomical knowledge.(anteriorly, posteriorly, superiorly, inferiorly, laterally and medially. It includes:
 - Exact location
 - Contents
 - Boundaries, etc.
 - Nerve supply, arterial supply, venous supply, lymphatics drainage, muscle attachment.

SURGICAL ANATOMY OF SCALP

- The scalp is made up 5 layers. Three layers are closely bounded together.
- These are:
 - a. Skin
 - b. Dense connective tissue
 - c. Galea aponeurotica- deep to this layer
 - d. Loose connective tissue
 - e. Periosteum or pericranial layer
- The scalp will bleed freely because the vessels are found firmly in the dense connective tissue.
- Because of the nature of the loose connective tissue layer, dissection of the scalp will be rather easy in this tissue plane.

- The innervations of the scalp
 - A. Trigeminal nerve—from anterior and laterally
 - B. Cervical nerve (C2, C3)—from posteriorly

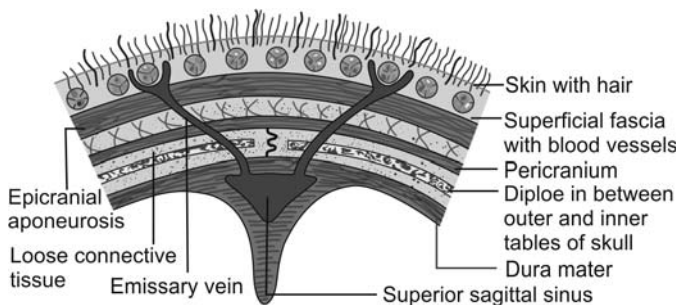


Fig. 2.1: Layers of scalp

- C. In the supra orbital region—the supra orbital branch of the trigeminal nerve passes through either a notch or a foramen to innervates this area of the scalp.
- D. The supra trochlear nerve is located slightly medially and innervates the upper lid and the medial area of the forehead.

SURGICAL ANATOMY OF SKIN OF FACE

- The skin of the face becomes specialized in the region of the eyelids which are composed of two structural lamellae.
- The external lamellae formed by the orbicularis muscle and its overlying skin. The internal lamellae of the tarsal plate and conjunctiva.
- The skin of the eyelid is extremely thin and delicate and contains small lacrimal, sweat and sebaceous glands as well as fine hair follicles.
- The skin of the nose is tightly attached to the lower lateral cartilage in the tip area.

- In other areas the skin is less tightly adherent to the underlying infrastructure.
- The skin is thin in the nasal root and tip areas and thicker in the supratip areas.

SURGICAL ANATOMY OF TEMPOROMANDIBULAR JOINT

- Temporomandibular joint (TMJ) is the diarthrodial freely movable articulation between the condyl of the mandible and squamous part of the temporal bone.
- TMJ is a complex structure, so many anatomical structure are present around the TMJ.
- Surgical anatomy includes:
 - a. Articulating surfaces
 - b. Ligamentous structure
 - c. Arterial supply
 - d. Venous supply
 - e. Nerve supply
 - f. Lymphatic drainage.

A. Articulating Surfaces

- Articulating surfaces of glenoid fossa is largely oval.

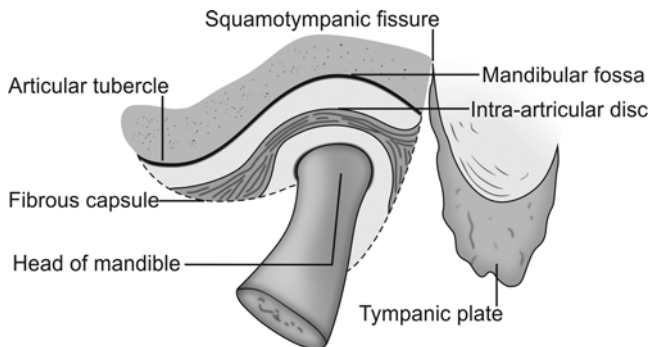


Fig. 2.2: Anatomy of temporomandibular joint

- Articular eminence is convex anteroposteriorly and concave mediolaterally.
- The foramen spinosum is located at the medial aspect.
- Condyl is elliptical in shape. Anteroposterior width is 5.5 mm to 16 mm. Mediolateral dimension ranges from 13 mm to 25 mm. Four types: Convex, flat, pointed, bulbous.

B. Ligamentous Structure

- I. Articular disc (articular meniscus)
 - Firm, flexible, band like structure (posterior band 3 mm, intermediate zone 1 mm, anterior band 2 mm in thickness)
 - Composed of dens fibrous connective tissue, avascular, non innervated.
- II. Articular capsule “Capsular ligament”
 - The TMJ is encapsulated articulation. The capsule defines the anatomical and functional boundaries of TMJ. Loose fibrous capsule surrounds the articular surface of the condyle.
 - Capsule of joint are lined by synovial fluid.
- III. Synovial membrane
 - At the birth synovial membrane covers all the internal surfaces of the joints including meniscus (articular disc).
 - Synovial membrane consists of two cell layers- the intima and the subintima.
 - As function commences, this lining is lost from all the articulating surfaces remaining only on the inner aspect of the capsule.
 - The functions are: Regulatory, secretory, phagocytic.
- IV. Temporomandibular or lateral ligament
 - The ligament attaches to the root of the zygomatic arch and down and backwards it attaches to the back of the condyle.

- The articular capsule is strongly reinforced laterally by TM ligament—fan shaped fibrous layer.
- Function—to control the movement of the condyle disc complex. To limits anterior movement of the condyle and prevent the condyle displaced away from the articular eminence.

V. Sphenomandibular ligament (internal ligament)

- It is medial to joint.
- It is flat and thin, attached above to the spine of sphenoid becoming broader as descends and attached to lingual. Laterally it is related to the lateral pterygoid and auriculotemporal artery. Lower down it is separated from neck of the mandible by “maxillary vessels”. Still lower-inferior alveolar vessels and nerve and a lobule of parotid gland lies between it and ramus of mandible. It is pierced by vessels and nerve to the mylohyoid.

VI. Stylomandibular ligament

- It is a specialized band of deep cervical fascia. It can be only considered as a accessory which stresses from apex of the styloid process to the angle and posterior border of ramus.

VII. Mandibulo malleolar ligament “Pinto ligament”

- Pinto and others described this ligament.
- This ligament of fibroelastic tissue with ligamentous qualities was found connecting the neck and anterior process of malleus, to the middle posterior superior part of the capsule, disc, sphenomandibular ligament.

C. Arterial Supply

- Through the internal maxillary artery, branch of external carotid artery, peripherally via its deep auricular artery

- Anterior aspect—deep posterior temporal, deep posterior massetric artery.
- Posterior medial aspect—deep auricular artery, anterior tympanic artery, middle meningeal artery
- Posterior lateral aspect—superficial temporal artery.

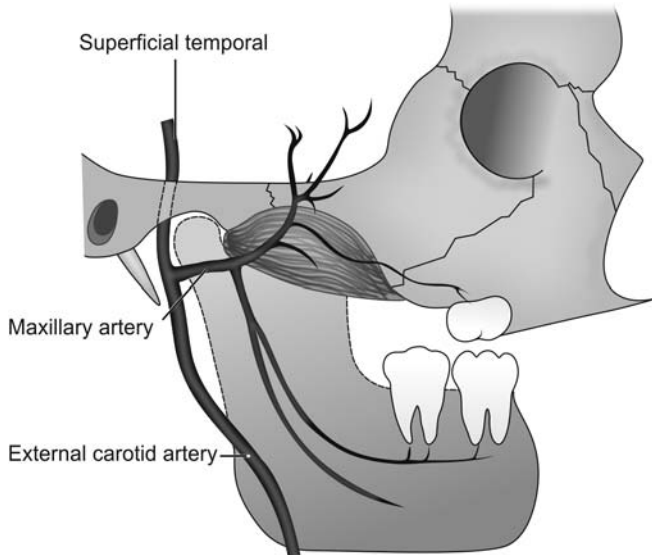


Fig. 2.3: Arterial supply of temporomandibular joint

D. Venous Drainage

- Veins of joint drain into:
 - i. Superficial temporal vein
 - ii. Maxillary vein
 - iii. Pterygoid venous plexus

E. Lymphatic Drainage

- From lateral and anterior surface—drain into preauricular and parotid nodes.

- From medial and posterior surface—drain into submandibular nodes.

F. Nerve Supply

- “Hilton’s law” state that—A nerve supplying a joint also supplies the muscle moving the joint and skin over the innervations of the same muscle.
- Anteromedial portion of the capsule—massetric nerve
- Anterolateral portion of the capsule—posterior deep temporal nerve.
- Medial, lateral, posterior and lateral half of the anterior wall of the capsule—auriculotemporal nerve.
- “The articular cartilage and articular disc (meniscus) central portion donot have any nerve and blood supply.

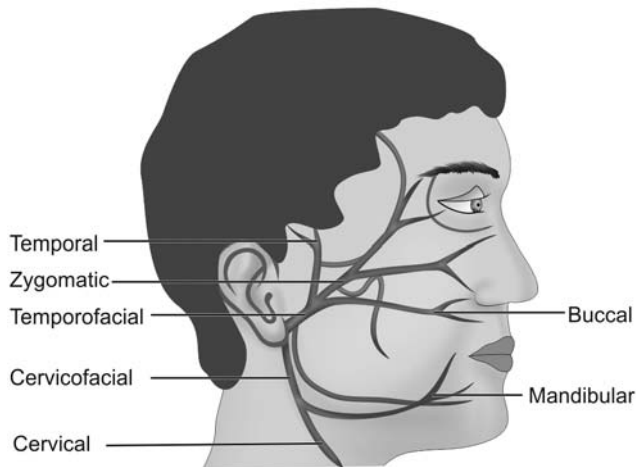


Fig. 2.4: Nerve supply of temporomandibular joint

SURGICAL ANATOMY OF CAVERNOUS SINUS

Number	: Two
Length	: 2 cm
Width	: 1 cm
Side	: Right and left
Situation	: In the middle cranial fossa
Bone location	: On either side of the body of the sphenoid bone

Boundaries

Floor: Formed by the endosteal dura mater

Lateral wall, roof, medial wall: Formed by the meningeal dura mater.

Extension

Anteriorly: Extends up to the medial end of the superior orbital fissure

Posteriorly: Up to the apex of the petrous temporal bone

Relations

A. Structure outside the sinus

1. Superiorly:
 - Optic tract
 - Optic chiasma
 - Olfactory tract
 - Internal carotid artery
 - Anterior perforated substance.
2. Inferiorly:
 - Foramen lacerum
 - Junction of the body and greater wing of the sphenoid bone.
3. Medially:
 - Hypophysis cerebri

- Sphenoidal air sinus.
 - 4. Laterally: Temporal lobe uncus.
 - 5. Anteriorly:
 - Superior orbital fissure
 - Apex of the orbit.
 - 6. Posteriorly:
 - Apex of the petrous temporal
 - Crus cerebri of midbrain.
 - B. Structure in the lateral wall of the sinus (from above to downward)
 1. Oculomotor nerve—3rd cranial nerve
 2. Trochlear nerve—4th cranial nerve
 3. Ophthalmic nerve—5th cranial nerve (1st branch)
 4. Maxillary nerve—5th cranial nerve (2nd branch)
 5. Trigeminal ganglion.
 - C. Structure passing through the center of the sinus
 1. Internal carotid artery
 2. Abducent nerve—7th cranial nerve
- Tributaries—In coming channels
- A. From the orbit
 - The superior ophthalmic vein
 - Inferior ophthalmic vein
 - The central vein of the retina.
 - B. From the brain
 - Superficial middle cerebral vein
 - Inferior cerebral veins.
 - C. From meninges
 - Sphenoparietal sinus
 - Frontal trunk of middle meningeal vein.

Draining Channels

The cavernous sinus drains

1. Into the transverse sinus through petrosal sinus

2. Into the internal jugular vein through inferior petrosal sinus
3. Into the pterygoid plexus veins through emissary veins
4. Into the facial vein through superior ophthalmic vein
5. The right and left cavernous sinus communicated with each other through the anterior and posterior intercavernous sinuses and through the basilar plexus of veins.

All these communications are valveless and blood can flow through them in either side.

Key Points

- Cavernous sinus is the dural venous sinus present in the middle fossa on either side of the sella turcica.
- It is a paired sinus.
Left—anterior and posterior
Right—anterior and posterior
- Both communicate with each other via anterior intercavernous sinus and posterior intercavernous sinus.
- The name cavernous means spongy that lies between the endosteal and meningeal dura mater.

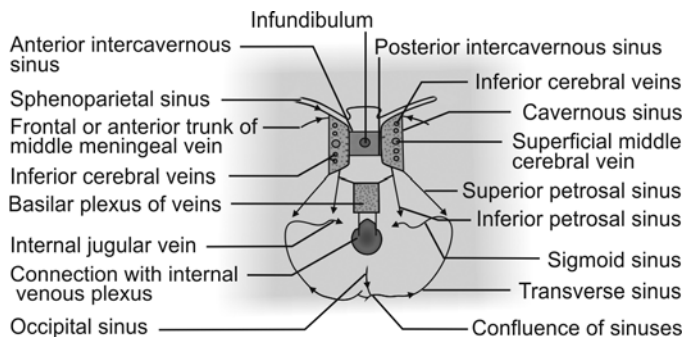


Fig. 2.5: Cavernous sinus and its communications

SURGICAL ANATOMY OF MAXILLARY SINUS

Synonym: Antrum of Highmore, maxillary antrum

Number: Two

Height: 3.7 cm

Width: 2.5 cm

Anteroposterior depth: 3.7 cm

Side: Left and right

Location: Cavity in the body of maxilla

Shape: Pyramidal in shape

Capacity of the sinus: 30 ml

Boundaries

1. Base: Lower portion of the lateral nasal wall
2. Apex: Projecting into the zygomatic process of maxilla and sometime into the body of the zygoma
3. Anterio lateral: Facial surface of the maxilla
4. Posterior: Infratemporal surface of the maxilla posterior wall
5. Superior: Orbital plate of the maxilla (the roof of the sinus is also the floor of the orbit)
6. Inferior: Alveolar and palatine process of the maxilla.

In the adult: The floor of the sinus is approximately 1 to 1.25 cm below the level of the floor of the nasal cavity. The upper molars are more in close proximity to the sinus.

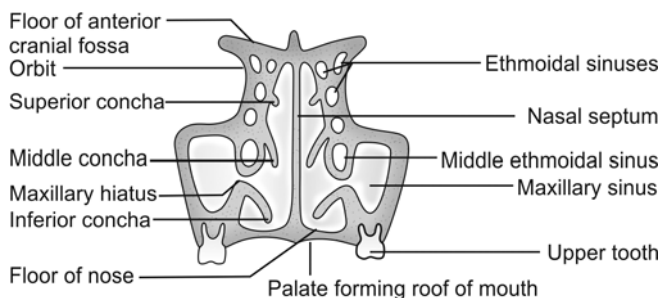


Fig. 2.6: Cross-section through maxillary air sinus

Surgical Anatomy

- A. Arterial supply:
 - Major arterial supply to the sinus by internal maxillary artery
 - To the mucous membrane—small arteries derived from facial, maxillary, infraorbital, greater palatine arteries
 - Posterior and anterior wall (infratemporal surface)—posterior superior alveolar artery
 - Orbital and anterior wall—anterior superior alveolar artery.
- B. Venous drainage:
 - Primarily through the anterior facial vein and angular vein to the inferior ophthalmic vein.
- C. Lymphatic drainage:
 - Through the ostium or infraorbital foramen into the nasal cavity toward the submandibular lymph nodes and deep cervical lymph nodes.
- D. Nerve supply:
 - To the mucous membrane—anterior/middle posterior superior alveolar nerve
 - Anterior sinus wall—anterior superior alveolar nerve
 - Posterior, lateral and anterior wall of sinus—middle superior alveolar nerve.

SURGICAL ANATOMY OF PAROTID GLAND

Key Points

1. One of the major salivary gland and pure serous gland.
 - The parotid gland double in size than submandibular gland, triple is size than sublingual gland.
2. It occupies roughly triangular bony space between the external auditory canal, ramus of mandible, mastoid process. The gland rest upon the - styloid process, transverse process of second cervical vertebra C2.

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3. Mainly three lobes
 - a. Superficial lobes
 - Wedged between the mastoid process and the posterior border of the mandible.
 - Extend forward over the masseter for a variable distance
 - From it emerge the parotid gland and 5 branch of facial nerve.
 - b. Glenoid lobe
 - Lies behind the mandibular joint.
 - Glenoid lobe contact in with both osseous and cartilagenous part of the external acoustic meatus. The auricular temporal nerve is in contact with this part of gland.
 - c. Deep lobe
 - Deep lobe is narrowed edge of the wedge shaped of gland lying in the contact with the internal jugular vein below the glenoid lobe.
4. Parotid compartment is a space located in front of the EAR contacting the parotid gland. Space containing the parotid gland is known as parotid space or compartment.

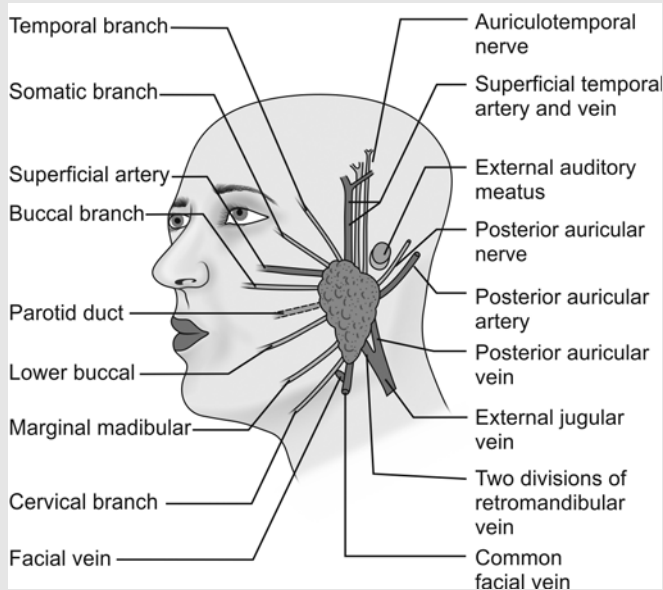


Fig. 2.7: Structures emerging at the periphery of parotid gland

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5. Three compartment
 - a. Nerve compartment "superficial portion"
 - Greater auricular nerve
 - Auriculotemporal nerve
 - Facial nerve.
 - b. Venous compartment "middle portion"
 - Superficial temporal nerve (uniting with)
 - Internal maxillary vein (to form)
 - Posterior facial vein (which divide into)
 - Anterior branch of posterior facial vein and
 - Posterior branch of posterior facial vein (which join)
 - Posterior auricular vein (to form)
 - External jugular vein
 - c. Arterial component "deep portion"
 - External carotid artery
 - Internal maxillary artery
 - Superficial temporal artery.

Nerve Supply

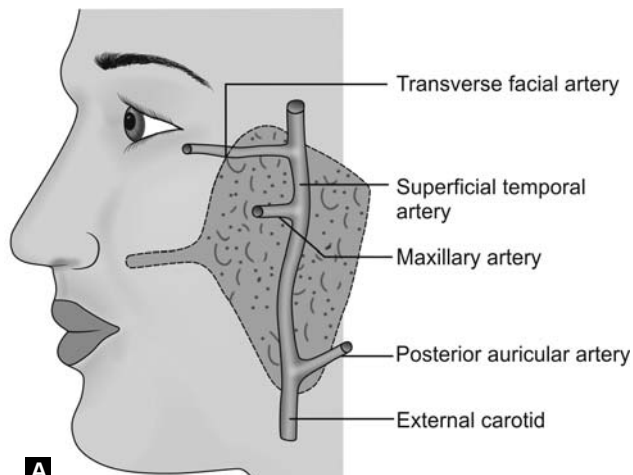
- A. The parasympathetic nerve are secretomotor. They reach the gland through the auriculotemporal nerve.
 - i. Preganglionic fibers
 - Begin in the inferior salivary nucleus passes through the glossopharyngeal nerve. (9th cranial nerve)—its tympanic branch "temporal plexus and lesser petrosal nerve
 - ii. Postganglionic fibers
 - Passes through auriculotemporal nerve and reach the gland
- B. Sympathetic nerve fibers are vasomotor
- C. Sensory nerve fibers—to the gland come from the auriculotemporal nerve but parotid fascia is innervated by sensory fibers of the greater auricular nerve.
(Parotid gland—auriculotemporal nerve
Parotid fascia—greater auricular nerve)

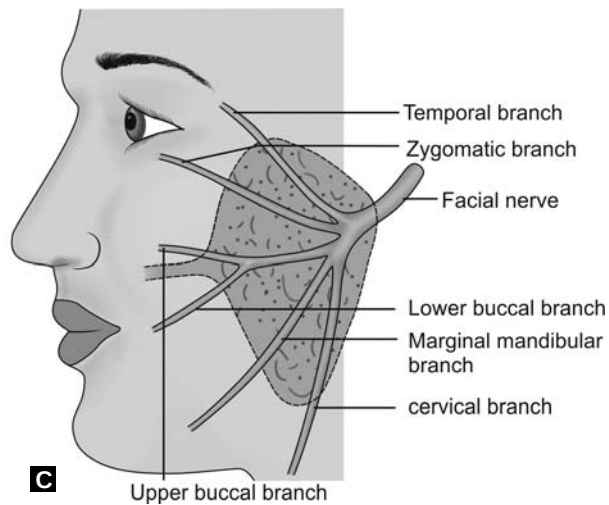
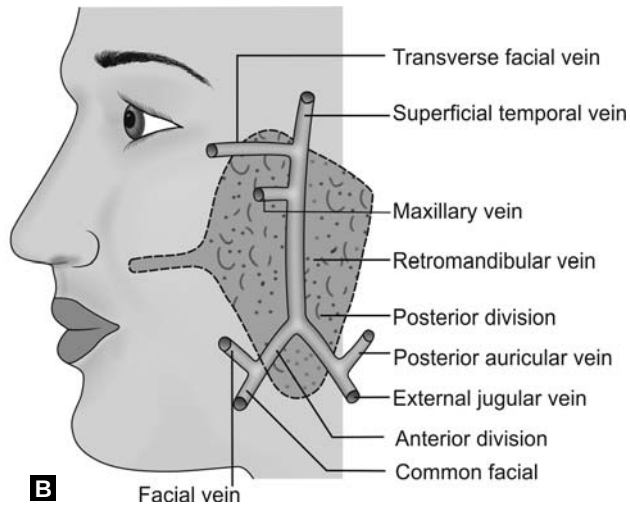
Arterial Supply

- Parotid gland is supplied by the "external carotid artery" and its branches near the gland:
 - i. Superficial temporal artery
 - ii. Transverse facial artery
 - iii. Maxillary artery
 - iv. Posterior auricular artery

Venous Drainage

- Veins drain into the "external jugular vein" it includes
 - i. Superficial temporal vein
 - ii. Transverse facial vein
 - iii. Maxillary vein
 - iv. Posterior auricular vein
 - v. Facial vein
 - vi. Common facial vein
 - vii. Retromandibular vein.

**A**



Figs 2.8A to C: Surgical anatomy of parotid gland

Lymphatic Drainage

Parotid lymphnodes can be classified as:

- i. Superficial paraglandular—
 - Superficial nodes are not within the substance of the gland but are preauricular to the parotid fascia sheath.
 - They empty into a superficial cervical chain of nodes along the external jugular vein.
- ii. Deep nodes—drain the glandular substance emptying posteriorly along the retromandibular vein into the deep cervical chain of nodes along the accessory nerve.
- iii. Subparotid nodes—drain in to the deep cervical nodal chain (jugulodiagastic) which is closely attached to the internal jugular vein.

SURGICAL ANATOMY OF SUBMANDIBULAR GLAND

Key Points

- One of the major salivary glands, paired gland.
- Serous element predominates.
- Occupies the space between the inferior border of mandible and hyoid bone.
- It is covered
 - Superiorly by the: Mylohyoid muscle, mucous membrane of the posterior floor of the mouth.
 - Inferiorly by the: Anterior and posterior bellies of digastrics muscle.
- The gland is enclosed in the anterior deep cervical fascia.
- Medial surface of the gland rest upon:
 1. Hyoglossus muscle
 2. Hypoglossal nerve
 3. Submandibular ganglion
 4. Lingual nerve
 5. Main duct, i.e. "Wharton's duct"
- Several nerves in the submandibular compartment are:
 - a. The gland is innervated by lingual nerve

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- b. Sympathetic nerve fibers from plexus
- c. Submandibular ganglion, parasympathetic secretory fibers from chorda tympania
- d. Mandibular branch of facial nerve passes between the platysma and facial vessels.

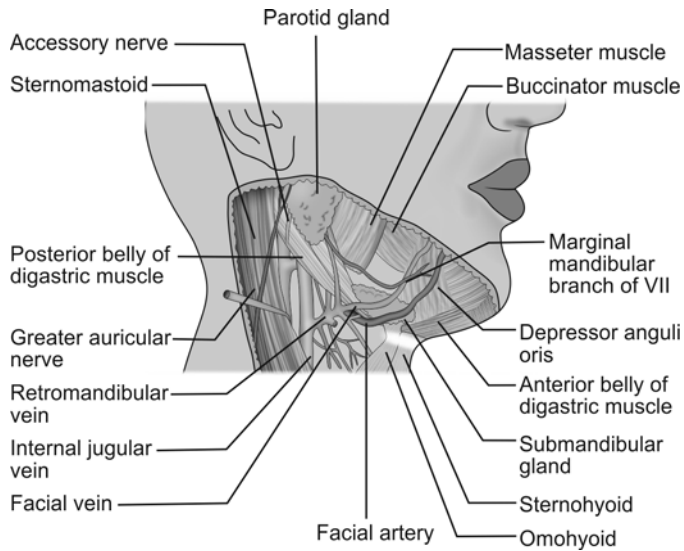


Fig. 2.9: Regional anatomy of submandibular gland

Nerve Supply

- It is supplied by submandibular ganglion
- Sensory fibers from lingual nerve
- Parasympathetic secretomotor fibers from—chorda tympani nerve
- Vasomotor sympathetic fibers from plexus.

Arterial Supply

- Facial artery (small arterial branches)—branch of external carotid artery

- Submental artery (small arterial branches) compose the arterial supply of the gland.

Venous Supply

Venous drainage into the common facial vein and lingual vein.

Lymphatic Drainage

- A group of submandibular lymph nodes adjacent to the gland.
- 4 to 6 in number beneath the mandible.
- The lymph nodes receive the lymphatic drainage from submandibular gland.
- These nodes are frequently involved in malignancies in their drainage area.

SURGICAL ANATOMY OF ORBIT

Introduction

- The orbits are bony pyramidal cavities situated each side of the root of the nose.
- Lodging the eyeballs, various muscle, nerves, blood vessels and lacrimal gland.
- Out of 12 pairs of cranial nerves
 - Optic nerve—2nd cranial nerve
 - Oculomotor nerve—3rd cranial nerve
 - Trochlear nerve—4th cranial nerve
 - Trigeminal nerve—5th cranial nerve
 - Abducent nerve—6th cranial nerve and some sympathetic fibers are present.

Orbital Cavity

1. Each bony orbit is composed of seven bones:

- Frontal
 - Zygoma
 - Maxilla
 - Lacrimal
 - Ethmoid
 - Sphenoid
 - Palatine
2. The orbit has medial and lateral surfaces, a roof, a floor.
 3. Medial wall is thin and ethmoidal air cells lie beneath this wall.
 4. The medial walls (lamina papyracea of ethmoid, lacrimal, palatine bones) are nearly parallel to the sagittal plane.
 5. The lateral walls (zygoma, sphenoid, frontal) are thick and diverge from the apex approximately 45 degree.
 6. The lateral orbital rim is formed by the zygoma and is posterior to the medial, superior and lateral orbital rim.
 7. The floor of the orbit (maxilla) is the roof of the maxillary sinus.
 8. It is extremely thin in the region of infraorbital groove which becomes the infraorbital canal.
 9. The roof of the orbit is thick and is formed mainly by the frontal bone and partly by the sphenoid bone.
 10. The roof of the orbit continues forward to form the superior orbital rim.
 11. Orbital rims are extremely strong and provide protection for the globe.

Contents of the Orbit

1. Eyeball:
 - A. Outer coat:
 - Sclera
 - Cornea
 - B. Middle coat:

- Choroid
- Ciliary body
- Iris
- C. Inner coat: Retina
- 2. Fascia:
 - Orbital
 - Bulbar
- 3. Muscles:
 - Extraocular
- 4. Vessels:
 - Artery
 - Vein
 - Lymphatics
- 5. Nerve
- 6. Lacrimal gland
- 7. Orbital fat

Eyeball

Eyeball is the organ of sight

1. Eyeball is suspended through the lockwood's ligament.
2. The lockwood's suspensory ligament is a fascial sling which support the globe of the eye, passing from the medial attachment in the region of the lacrimal bone, to get inserted laterally into the whitnall's tubercle on the lateral wall of the orbit.
3. The eyeball filled with vitreous humor and remaining of the orbital cavity is filled with fat.
4. Mainly three coat: Outer coat, middle coat, inner coat

A. Outer coat

- a. Sclera (*skleros* = hard)
 - It is opaque and forms the posterior 5th to 6th of the eyeball, composed of dense fibrous tissue which is firms and maintains the shape of the eyeball.

- Sclera shows numerous perforation for passage of fibers of the optic nerve because of its sieve like appearance this region is called the lamina cribrosa (crib = sieve)
 - Outer surface of the sclera is white and smooth, it is covered by Tenon's capsule. It can be seen as the white of the eye.
 - The sclera is pierced continuous anteriorly with the cornea.
 - The sclera is pierced by a number of the structure: The optic nerve, ciliary nerves and arteries, the anterior ciliary arteries, four venae vorticosae or the coroid veins.
- b. Cornea
- The cornea is transparent. More convex than sclera, junction with sclera is known as sclerocorneal or limbus.
 - Cornea is avascular and is nourished by the lymph which circulate in the numerous corneal spaces.
 - It is supplied by branch of the ophthalmic nerve (through the ciliary ganglion) and a short ciliary nerves.
 - Cornea consists of these layers histologically:
 - i. Corneal epithelium
 - ii. Bowman's membrane
 - iii. Substantia propria
 - iv. Descemet's membrane
 - v. Simple squamous mesothelium

B. Middle coat

- a. Choroid: It is a thin pigmented layer structurally. It consists of—
- i. Supra choroidal lamina
 - ii. Vascular lamina
 - iii. Choroid capillary lamina

- iv. The inner basal lamina or Membrane of Bruch.
- b. Ciliary body: It is a thickened part of the uveal tract. It suspends the lens and help it in accommodation for near vision.
- c. Iris:
 - This is the anterior part of the uveal tract.
 - It forms a circular curtain with an opening in the center called as pupil. It controls the amount of light entering the eye.
 - The color of iris is determined by the number of pigment cells in the connective tissue.

C. Inner coat-Retina

- It is thin, delicate inner layer of the eyeball.
- It is continuous posteriorly with the optic nerve.
- Retina is composed of 10 layers:
 - i. Outer pigmented layer
 - ii. Layers of rods and cones
 - iii. External limiting membrane
 - iv. Outer nuclear layer
 - v. Outer plexiform layer
 - vi. Inner nuclear layer
 - vii. Inner plexiform layer
 - viii. Ganglion cell layer
 - ix. Nerve fiber layer
 - x. Internal limiting layer
- Retina is supplied by central artery
- The retinal veins runs with arteries.

Fascia

- A. Orbital fascia—“Periorbita”: It forms the periosteum of the bony orbit due to the loose connection to bone, it can be easily stripped.

- B. Bulbar fascia or fascial sheath of eyeball: The eyeball can freely move within this sheath. The sheath is pierced by:
- Tendons of various extraocular muscle
 - Ciliary vessels and nerves around the entrance of the optic nerve.

Extraocular Muscles

- A. Voluntary muscles
- Four recti
 - Superior rectus
 - Inferior rectus
 - Medial rectus
 - Lateral rectus
 - Two oblique
 - Superior oblique
 - Inferior oblique
 - The levator palpebrae superioris elevates the upper eyelids
- B. Involuntary muscles
- The superior tarsal muscle
 - The inferior tarsal muscle
 - The orbitalis bridges the inferior orbital fissure

Vessels

- A. Arterial supply through ophthalmic artery.
- Branches:
- Central artery of retina is an end artery.
 - Branches arising from the lacrimal artery
 - Branches are given to lacrimal gland
 - Two zygomatic branches
 - Lateral palpebral branches supply to eyelid
 - Recurrent meningeal branch
 - Muscular branches supply the muscles of the orbit.

- iii. Branches arising from the main trunk
 - The posterior (long and short) ciliary arteries
 - The supraorbital and supratrochlear branch supply to skin of the forehead
 - The anterior and posterior ethmoidal branches
 - The medial palpebral branches supply the eyelids.

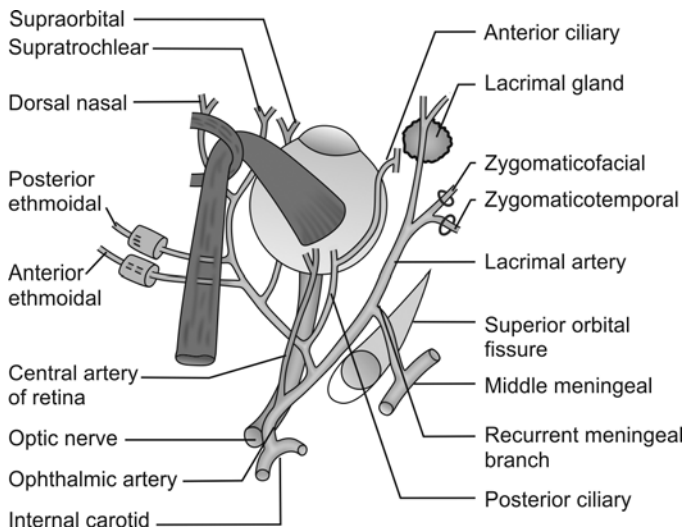


Fig 2.10: Arterial supply of eyeball

- B. Venous supply through ophthalmic veins
 - i. Superior ophthalmic vein: It accompanies the ophthalmic artery. It lies above the optic nerve, passes through the superior orbital fissure and the drain into the cavernous sinus.
 - ii. Inferior ophthalmic vein
 - It runs below the optic nerve.
 - It joins with superior ophthalmic vein or directly drain into cavernous sinus. It

communicates with the pterygoid plexus of veins.

- C. Lymphatics of the orbit: The lymphatics drain into the preauricular parotid lymph nodes.

Nerve Supply

- I. Optic nerve
 - Second cranial nerve
 - It is the nerve of sight.
 - Nerve is 4 cm long.
 - The entire nerve enclosed in three meningeal sheath.
- II. Oculomotor nerve
 - Third cranial nerve
 - For movements of the eyeball
 - For contraction of the pupil and accommodation
 - For proprioceptive impulses for the muscles of the eyeball.
- III. Trochlear nerve
 - Fourth cranial nerve
 - It supplies only the superior oblique muscle of the eyeball
- IV. Abducent nerve
 - Sixth cranial nerve
 - Supplies the lateral rectus muscle of the eye.
- V. Lacrimal nerve
 - Smallest branch of ophthalmic nerve (1st branch of TN VCN)
 - Supplies lacrimal gland, conjunctiva and upper eyelid.
- VI. Frontal nerve: Largest branch of ophthalmic nerve
 - a. Supraorbital: It supplies conjunctiva, the central part of the upperlid, frontal air sinus and skin of the forehead, scalp up to the vertex.

- b. Supratrochlear: Supplies the conjunctiva, the upper eyelid, small area of the skin of the forehead above the root of the nose.

VII. Nasociliary nerve:

- Terminal branch of ophthalmic nerve.
- Different branches of nasociliary nerve supplies conjunctiva, lacrimal sac, caruncle, medial end of the eyelids and upper half of the external nose.

VIII. Infraorbital nerve:

- Branch of 5th cranial nerve—2nd division “maxillary nerve”
- It enters the orbit through the infraorbital tissue and runs forward in the floor of the orbit.

IX. Zygomatic nerve:

- Branch of 5th cranial nerve—2nd division “maxillary nerve”, given off in the pterygoid palatine fossa.
- It enters the orbit through the lateral end of the inferior orbital tissue and run along the lateral wall outside the periosteum.

X. Sympathetic nerves of the orbit:

- Arise from the internal carotid plexus and enter the orbit through the dilator pupillae of the iris, plexus surrounds the ophthalmic artery, internal carotid plexus, other filament pass through III, IV, VI and ophthalmic nerve.
- Sympathetic nerve are vasomotor in function.

Lens

- The lens is a transparent biconvex structure which is placed between the anterior and posterior segments of the eye.
- Circular in outline.
- The chief advantage of the lens is that it can vary its dioptric power.

- Posterior surface is more convex than the anterior. The lens is enclosed in a transparent structureless elastic capsule.
- The center of (nucleous) the lens is firm and consists of the oldest fibers whereas the periphery (cortex) is soft and is made up of more recently formed fibers.

Aqueous Humor

- This is a clear fluid which fills the space between the cornea in front and the lens behind the anterior segment.
- The aqueous humor is secreted into the posterior chamber from the capillaries in the ciliary processes.
- Interference with the drainage of the aqueous humor into the canal of Schlemm results in an increase of intraocular pressure "glaucoma".
- This produces cupping of optic disc and pressure atrophy of the retina causing "blindness".
- The aqueous humor is rich in ascorbic acid and glucose, amino acid, and nourishes the avascular tissues of the cornea and lens.

Vitreous Body

- It is colorless, jelly like transparent mass which fills the posterior segment (posterior 4/5th) of the eyeball.
- It is enclosed in a delicate homogeneous hyaloid membrane.
- The cut surface of the vitreous body is indented by the lens and ciliary processes.

SURGICAL ANATOMY OF TONGUE

Introduction

- The tongue is a muscular organ.

- It is associated with function of taste, speech, mastication, deglutition.
- The tongue has- oral part and pharyngeal part. Oral part lies in the pharynx and mouth. Pharyngeal part lies in pharynx. Both part separated by V shaped sulcus known as sulcus terminalis.
- The tongue has—root, tip, body.
- The tip of the tongue forms the anterior free end.
- The root is attached to the mandible and soft palate above and the hyoid bone below.
- The body has a curved upper surface or dorsum and an inferior surface.
- The dorsum of tongue is convex—the oral part is anterior 2/3rd and pharyngeal part is 1/3rd posteriorly.
- The two limb of V meet at point median pit named foramen cecum.

The Oral or Papillary Part

- Each margin shows 4 to 5 vertical fold known as foliate papillae. Superior surface shows a median furrow.
- Inferior surface covered with smooth mucous membrane which shows a median fold known as Frenulum linguae.
- On either side of frenum—there is prominence produced by deep lingual vein.
- More laterally there is a fold called the plica fimbriata.

The Pharyngeal or Lymphoid Part

- Its posterior part also known as oropharynx.
- Has many lymphoid follicles that collectively constitute the lingual tonsil.
- Mucous gland also present.

- Posterior most part of the tongue is connected with the epiglottis.
- On either side of median fold there is a depression called as vallecula.

Papillae of the Tongue

1. Vallate or circumvallate papillae:
 - 1 to 2 mm in diameter
 - 8 to 12 in number
 - Immediate in front of sulcus terminalis.
2. Fungiform papillae:
 - Numerous bright red in color
 - Near tip and margins of the tongue
3. Filiform papillae or conical papillae:
 - Cover presulcal area dorsum of tongue
 - Give velvety appearance
 - Smallest and more numerous.

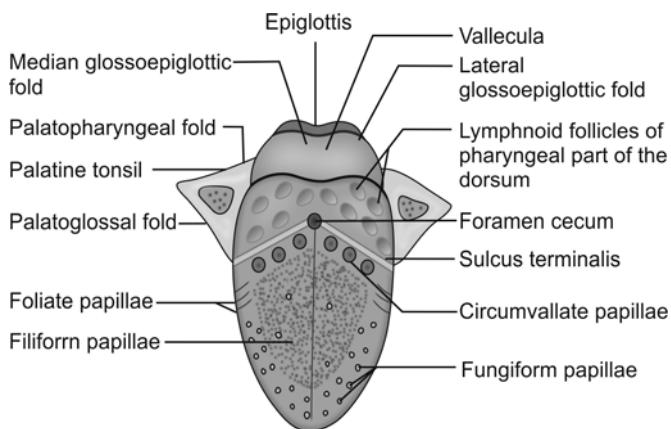


Fig. 2.11: Dorsum of tongue

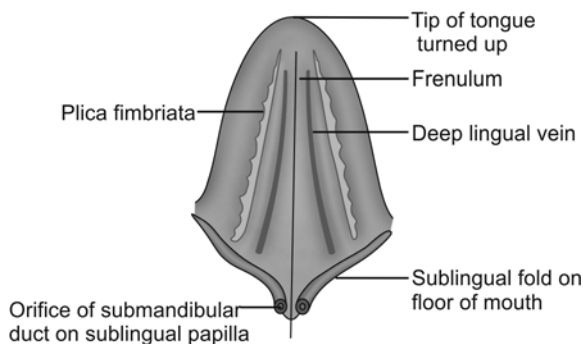


Fig. 2.12: Inferior surface of tongue

Muscles of Tongue

Each half contains 4 intrinsic and 4 extrinsic muscles

Intrinsic Muscles

1. Superior longitudinal
2. Inferior longitudinal
3. Transverse
4. Vertical

Extrinsic Muscles

1. Genioglossus
2. Hyoglossus
3. Styloglossus
4. Palatoglossus

Arterial Supply

- Chiefly derived from the lingual artery, a branch of external carotid artery.
- Also supplied by facial artery branch of tonsillar artery.

- Also by ascending pharyngeal artery branch of ascending palatine artery.

Venous Drainage

- The arrangement of the veins of the tongue is variable.
- Two veins accompanies lingual artery. One vein accompanies hypoglossal nerve.

Lymphatic Drainage

- The tip of the tongue drains bilaterally to the submental nodes.
- The right and left halves of the remaining part of the anterior 2/3rd of the tongue drain unilaterally to the submandibular nodes.
- Posterior 1/3rd of the tongue drains bilaterally to the jugulo-omohyoid nodes.

Nerve Supply

1. Motor nerve supply
 - Accessory nerve—11th cranial nerve
 - Hypoglossal nerve—12th cranial nerve.
 2. Sensory nerve supply
 - Trigeminal nerve—5th cranial nerve
 - Facial nerve—7th cranial nerve
 - Glossopharyngeal nerve—9th cranial nerve
 - Vagus nerve—10th cranial nerve.
- A. Motor nerve supply
1. Palatoglossal muscle—supplied by accessory nerve (11th cranial nerve), cranial part through the pharyngeal plexus
 2. All extrinsic and intrinsic muscles (except palatoglossal muscle extrinsic muscle) supplied by—hypoglossal nerve (12th cranial nerve)

B. Sensory nerve supply

1. Lingual branch of mandibular nerve (V3): For general sensation in the presulcal region.
2. Chorda tympani branch of the facial nerve (7th cranial nerve): Running in the sheath of the lingual nerve for gestation in the presulcal region (exclusive of the vallate papillae).
3. Lingual branch of glossopharyngeal nerve (9th cranial nerve): Distributed to the postsulcal mucosa of the lingual base and sides and to the vallate papillae mediating general gustatory sensation.
4. Superior laryngeal nerve of vagus nerve (10th cranial nerve): Sends fine rami to the root of the tongue.

SURGICAL ANATOMY OF TRACHEA**Introduction****Key Points**

- Trachea is a non-collapsible, wide tube forming beginning of the lower respiratory passage.
- It is kept patent because of the presence of C-shaped cartilaginous ring in the wall.
- The cartilages are deficient posteriorly. This part wall is being made up of muscle (Trachealis) and fibrous tissue.
- The soft posterior wall allow expansion of the esophagus during passage of food.

Gross Anatomy

- The trachea is about 10 to 15 cm long.
- Its upper half lies in the neck and its lower half in the superior mediastinum.
- The external diameter measures 2 cm in the male and 1.5 cm in the female.

- The lumen is smaller in the living than in cadavers.
- It is about 3 mm at the age of 1 year of age.
- Maximum 12 mm at puberty.

Cervical Part of Trachea

- The trachea begins at the lower border of the cricoids cartilage opposite the lower border of vertebrae C6.
- It runs downward and slightly backward in front of the esophagus, follows the curvature of the spine and enters the thorax in the median plane.

In the Neck

The trachea is comparatively superficial and has the following relation.

Anterior

1. Isthmus of the thyroid gland covering the 2nd and 3rd tracheal rings.
 2. Inferior thyroid vein below the isthmus.
 3. Pretracheal fascia enclosing the thyroid and the inferior thyroid veins.
 4. Sternohyoid and sternothyroid muscles.
 5. Investing layer of the deep cervical fascia
 6. Supersternal space
 7. Skin and superficial fascia.
- In children: the left brachiocephalic vein extend into the neck then lies in front of trachea.

Posterior

1. Esophagus
2. Longus colli
3. Recurrent laryngeal nerve in the trachea oesophageal groove.

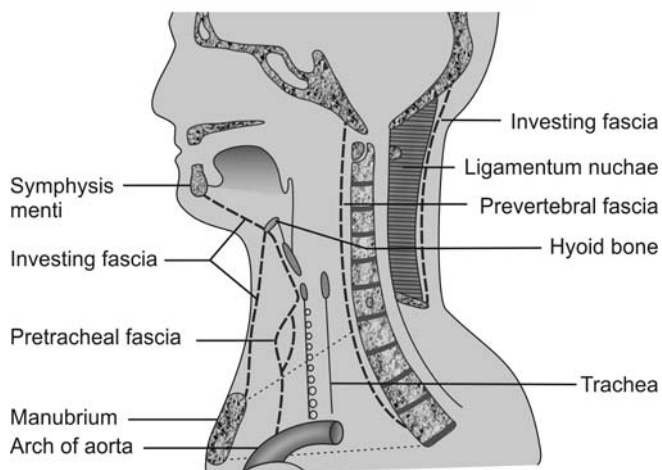


Fig. 2.13: Applied anatomy of trachea

On Each Side

1. The corresponding lobe of the thyroid gland.
2. CCA within the carotid sheath.

Arterial Supply

Branches from the inferior thyroid arteries.

Venous Drainage

Branches from inferior thyroid vein, the veins drain into the left branchiocephalic vein.

Lymphatic Drainage

Drain into pretracheal and paratracheal nodes.

Nerve Supply

- Parasympathetic nerves (from the vagus through the recurrent laryngeal nerve) are sensory. Secretomotor to the mucous membrane. Motor to the trachealis muscle
- Sympathetic nerves (from cervical ganglion) are vasomotor.

SURGICAL ANATOMY OF LARYNX

Introduction

Key Points

- Larynx or voice box is well developed in humans.
- The larynx is the organ for production of voice or phonation.
- It is an air passage and act as a sphincter at the inlet of the lower respiratory passage.
- Upper respiratory passage include nose, nasopharynx and oropharynx.
- The larynx lies in the anterior midline of the neck.
- Extending from the root of the tongue to the trachea.
- In the adult male: It lies in front of the 3rd to 6th cervical vertebrae.
- In children and adult females: It lies at a little higher level.
- The length of the larynx is 44 mm in males, 36 mm in female.
- The larynx is made up of a skeletal framework of cartilage.
- The cavity of the larynx is lined by mucous membrane.
- Larynx contains 9 cartilage: 6 paired cartilage and 3 unpaired cartilage.

Unpaired cartilage

1. Thyroid
2. Cricoid
3. Epiglottic

Paired cartilage

1. Arytenoid
2. Corniculate
3. Cuneiform

- The intrinsic muscles of larynx are supplied by the recurrent laryngeal nerve except the cricothyroid which is supplied by the external laryngeal nerve.

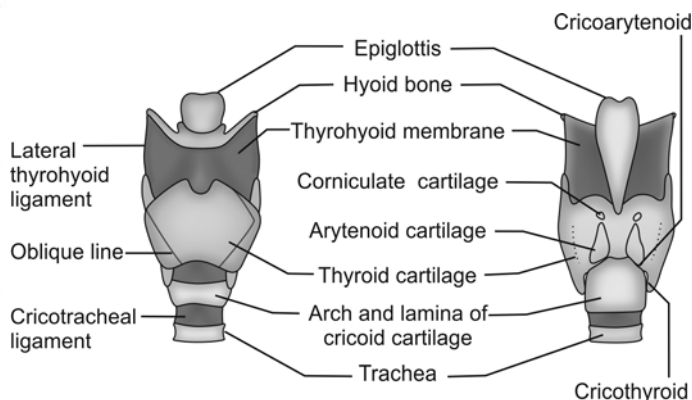


Fig. 2.14: Skeleton of larynx

Arterial Supply and Venous Drainage

- Up to the vocal folds by the superior laryngeal artery—a branch of the superior thyroid artery.
- The superior laryngeal vein drain into the superior thyroid vein.
- Below the vocal folds—by the inferior laryngeal artery—a branch of the inferior thyroid artery.
- The inferior laryngeal vein drains into the inferior thyroid vein.

Laryngeal Drainage of Larynx

- From the part above the vocal folds drain along the superior thyroid vessels to the anteriosuperior group of deep cervical nodes.
- Those from the part below the vocal folds drain to the posterior inferior group of deep cervical nodes.
- A few of them drain through the prelaryngeal nodes.

Nerve Supply

- Motor nerve: All intrinsic muscles of the larynx are supplied by the recurrent laryngeal nerve except for the cricothyroid which is supplied by the external laryngeal nerve.
- Sensory nerve: The internal laryngeal nerve supplies the mucous membrane up to the level of the vocal folds. The recurrent laryngeal nerve supplies it below the level of the vocal folds.

SURGICAL ANATOMY OF PHARYNX

Introduction

Key Points

- The pharynx is a wide muscular tube, situated behind the nose, the mouth, the larynx.
- Clinically part of upper respiratory passages.
- Upper part transmits-only air
Middle part is for both—air and food
Lower part below the inlet of the larynx—only food.
- Length of pharynx: 12 cm
- Width: In upper part it is widest: 3.5 cm and more collapses
Middle part is narrow
Lower end is the narrowest part of the gastrointestinal tract.

Boundaries

1. Superiorly: Base of the skull.
2. Inferiorly: Continuous with the esophagus at the level of the 6th cervical vertebrae.
3. Posteriorly: Pharynx glides freely on the prevertebral fascia.
4. Anteriorly: It communicates with the nasal cavity, oral cavity and the larynx.

Part of the Pharynx

- A. Nasal part: Nasopharynx
- B. Oral part: Oropharynx
- C. Laryngeal part: Laryngopharynx

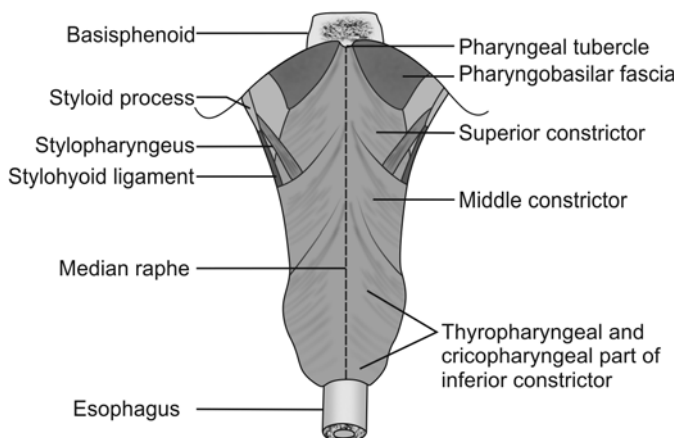


Fig. 2.15: Wall of pharynx

Structure of Pharynx

The wall of the pharynx is composed of the following 5 layers from within to outwards:

1. Mucosa
2. Submucosa
3. Pharyngeal aponeurosis (pharyngobasilar fascia)
4. The muscular coat
5. The buccopharyngeal fascia

Muscles of Pharynx

- A. Three pairs of constrictor muscles:
 - i. Superior constrictor muscle
 - ii. Middle constrictor muscle

- iii. Inferior constrictor muscle.
- B. Longitudinal muscle coat of pharynx:
 - i. Stylopharyngeus
 - ii. Salpingopharyngeus
 - iii. Palatopharyngeus.

Nerve Supply

- Pharynx is supplied by “The pharyngeal plexus of nerve” which lies chiefly on the middle constrictor.
- The plexus is formed by:
 - a. The pharyngeal branch of the vagus nerve
 - b. The pharyngeal branch of the glossopharyngeal
 - c. The pharyngeal branches of the superior cervical sympathetic ganglion.
- Motor fibers from the cranial accessory nerve through the vagus, they supply all muscles of pharynx. Except the stylopharyngeus which is supplied by the glossopharyngeal nerve.
- Sensory fibers from the pharynx travel mostly through the glossopharyngeal nerve.

Arterial Supply

The arteries supplying the pharynx are as follows:

- I. Ascending pharyngeal branch of the external carotid artery.
- II. Ascending palatine and tonsillar branches of facial artery.
- III. Dorsal lingual branches of the lingual artery.
- IV. The greater palatine , pharyngeal and pterygoid branches of the maxillary artery.

Venous Drainage

- The veins forms a plexus on the “Posterolateral aspect of the pharynx”.

- The plexus receives blood from the pharynx and soft palate and prevertebral region.
- It drains into the internal jugular and facial veins.

Lymphatic Drainage

Lymph from the pharynx drain into the retropharyngeal and deep cervical lymph nodes.

SURGICAL ANATOMY OF NOSE

Introduction

- Nose is a respiratory passage.
- Upper one third is lined by the olfactory mucosa.
- Rest of nasal cavity is lined by respiratory.
- Nasal mucous membrane is quite vascular. It may cause bleeding from "Little's area".
- Nose is divided into two part:
 - a. External nose.
 - b. Nasal cavity.

External Nose

Key Points

- The external nose has a skeletal frame work that is partly bony and partly cartilaginous.
- The cartilages are the superior/inferior cartilages and the septal cartilages and some small cartilages.
- The skin over the external nose is supplied by the external nasal, infratrochlear and infraorbital nerves.

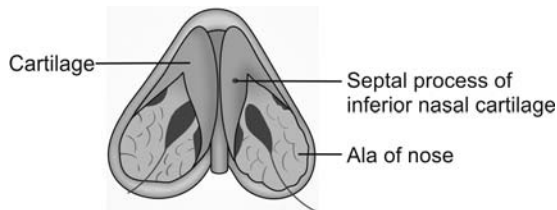


Fig. 2.16: Anatomy of nose

Nasal Cavity

Key Points

- Extends from external nares or nostril to the posterior nasal apertures.
- Subdivided into right and left halves by the nasal septum.
- Each half has a roof, floor, medial and lateral walls.
- Each half measures:
 - Height: 5 cm
 - Length: 5 to 7 cm
 - Near the floor width: 1.5 cm
 - Near the roof width: 1 to 2 mm

Nasal Septum

- It is a median osseocartilagenous partition.
- The bony part is formed by:
 - i. Vomer
 - ii. Perpendicular plate of the ethmoid.
- The cartilaginous part is formed by:
 - i. Septal cartilage
 - ii. Septal processes of the inferior nasal cartilages.
- Lower end formed by fibrofatty tissue covered by skin known as columella.
- It has four borders:
 1. Superior
 2. Inferior
 3. Anterior

4. Posterior
- Two surfaces:
 1. Right
 2. Left

Arterial Supply

- Anterosuperior = Anterior ethmoidal artery
- Posterosuperior = Posterior ethmoidal artery
- Anteroinferior = Superior labial artery, branch of the facial artery
- Posteroinferior = Sphenopalatine artery

Kiesselbach's Plexus or Little's Area

- The anteroinferior part or vestibule of the septum contains anastomoses between the septal ramus of the "superior labial branch of the facial artery", Branch of the sphenopalatine artery" and anterior ethmoidal artery.
- These form a large capillary network called the "Kiesselbach's plexus".
- This is a common site of bleeding from the nose or epistaxis. It is known as Little's area.

Venous Drainage

- The veins form a plexus which is more marked in the lower part of the septum or Little's area.
- The plexus drain anteriorly into the facial vein.
- Posteriorly through the sphenopalatine vein to pterygoid plexus of venous plexus.

Lymphatic Drainage

- Anterior half to the "submandibular nodes".
- Posterior half to the "retropharyngeal nodes, deep cervical nodes".

Nerve Supply of Nose (Nasal Cavity)

- I. General sensory nerves: Arising from trigeminal nerve, distributed to whole of the septum.
 - a. Anterior superior part of septum: Internal nasal branch of the anterior ethmoidal nerve.
 - b. The posterior inferior part is supplied by nasopalatine branch of pterygopalatine ganglion.
 - c. The posterior superior part is supplied by medial posterior superior nasal branch of the pterygopalatine ganglion.
- II. Special sensory nerves or olfactory nerves confined to the upper part or olfactory area.

Lateral Wall of the Nose

- The lateral wall of the nose is irregular owing to the presence of three shelf like bony projection called conchae.
- The lateral wall separate the nose:
 - a. From the orbit above
 - b. From the maxillary sinus below
 - c. From lacrimal groove and naso lacrimal canal from front.
- The lateral wall can be divided into:
 - A. Small depressed part is the anterior part, known as vestibule.
 - B. Middle part is known as atrium of the middle meatus.
 - C. Posterior part contains the conchae. Spaces separating the conchae are called meatuses.
- The bony part of lateral wall formed by following bone:
 - i. Nasal
 - ii. Frontal process of maxilla
 - iii. Lacrimal

- iv. Labyrinth of ethmoid with superior and middle conchae
- v. Inferior nasal conchae
- vi. Perpendicular plate of the palatine bone
- vii. Medial pterygoid plate
- The cartilaginous part is formed by:
 - a. Superior nasal cartilage
 - b. The inferior nasal cartilage
 - c. Around 3 or 4 cartilage of the ala

SURGICAL ANATOMY OF EAR

Key Points

1. The ear consists of:
 - a. External ear
 - b. Middle ear
 - c. Internal ear
2. The external ear consists of:
 - i. The auricle or pinna
 - ii. External acoustic meatus
3. The intrinsic muscle alter the shape of the auricle
4. Extrinsic muscle move the auricle as a whole.
5. Tympanic membrane

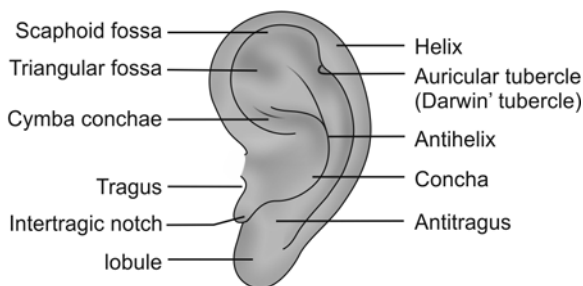


Fig. 2.17: Anatomy of ear

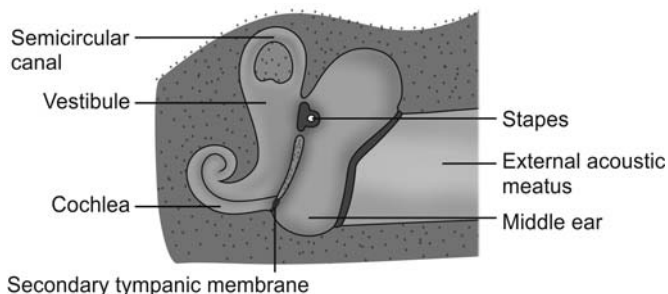


Fig. 2.18: Parts of ear

External Ear or Auricle or Pinna

- The arterial supply of auricle: posterior auricular and superficial temporal arteries.
- Lymphatic drainage of auricle: Into preauricular, post auricular and superficial cervical lymph nodes.
- Nerve supply of auricle or pinna:
 - i. Upper 2/3rd of lateral surface of the auricle: Auriculotemporal nerve
 - ii. Lower 1/3rd of lateral surface of auricle: Greater auricular nerve
 - iii. Upper 2/3rd of the medial surface: Lesser occipital nerve
 - iv. Lower 1/3rd of auricle: Greater auricular nerve
 - v. The root of auricle: Auricular branch of the vagus.
 - vi. The auricular muscles are supplied by branches of the facial nerve.

External Acoustic Meatus or Canal

- It conducts sound waves from conchae to the tympanic membrane.
- The meatus or canal is 24 mm long (18 mm bony and 8 mm cartilagenous).

- Blood supply:
 - i. Outer part by: Superficial temporal and posterior auricular artery
 - ii. Inner part by: Deep auricular branch of maxillary artery.
- Lymphatic drainage: The lymphatics pass to preauricular, postauricular and superficial cervical lymph nodes.
- Nerve supply:
 - i. Anterior half of the meatus: Auriculotemporal nerve
 - ii. Posterior half of the meatus: Auricular branch of the vagus.

Tympanic Membrane

- It is a thin translucent partition between the external acoustic membrane and middle ear.
- Membrane has outer and inner surfaces.
- Membrane lined by 3 layers:
 - i. The outer cuticular layer of skin
 - ii. Middle fibrous layer
 - iii. Innermost layer.

Arterial Supply

- Outer surface is supplied by deep auricular branch of the maxillary artery.
- Inner layer by anterior tympanic branch of the maxillary artery and by the posterior tympanic branch of stylomastoid branch of the posterior auricular artery.

Venous Drainage

- Veins from outer surface drain into the external jugular vein.

- From inner surface drain into transverse sinus and into venous plexus around the auditory tube.

Lymphatic Drainage

Lymphatics pass to the preauricular and retropharyngeal lymph nodes.

Nerve Supply

- Outer surface: Anterior inferior part is supplied by auriculotemporal nerve. Posterior superior part is supplied by auricular branch of the vagus nerve.
- Inner surface: Tympanic branch of the glossopharyngeal nerve through tympanic plexus.

Middle Ear/Tympanic Cavity/Tympanum

- Middle ear is narrow airfilled space.
- It is situated in the petrous part of the temporal bone between the external ear and internal ear.
- Middle ear is like cube shape.
- It is subdivided into: Tympanic cavity proper and epitympanic recess.

Arterial Supply

- Anterior tympanic branch of the maxillary artery.
- Posterior tympanic branch of the stylomastoid branch of the posterior auricular artery.
- Superior tympanic branch of the middle meningeal artery.
- The inferior tympanic branch of the ascending pharyngeal artery.
- Tympanic branch of the artery of the pterygoid canal.
- The carotico tympanic branch of the internal carotid artery.
- Petrosal branch of the middle meningeal artery.

Venous Drainage

Drain into the superior petrosal sinus and the pterygoid plexus of the vein.

Lymphatic Drainage

Lymphatics pass to the preauricular and retropharyngeal lymph nodes.

Nerve Supply

- The tympanic branch of the glossopharyngeal nerve.
- The superior and inferior caroticotympanic nerve.

Inner Ear/Labyrinth

- It lies in petrous part of the temporal bone.
- It consists of bony labyrinth and membranous labyrinth.
- Arterial supply: Labyrinthine branch of the basilar artery. Partly from stylomastoid branch of posterior auricular artery.
- Venous drainage: The labyrinthine vein drain in the superior petrosal sinus or the transverse sinus.
- Nerve supply: Vestibulocochlear nerve.

SURGICAL ANATOMY OF HARD PALATE

Key Points

- It is partition between the nasal cavity and oral cavity.
- Its anterior 2/3rd is formed by the palatine process of the maxillae and its posterior 1/3rd by the horizontal plate of the palatine bones.
- Boundaries:
 - a. Antero-lateral margins of the palate are continuous with the alveolar arches and gums.
 - b. The posterior margin give attachment to the soft palate.
 - c. The superior surface forms the floor of the nose.
 - d. Inferior surface forms the roof of the oral cavity.

Blood Supply

1. Arteries: Greater palatine artery, branch of maxillary artery.
2. Veins: Drain into the pterygoid plexus of veins.
3. Lymphatic drainage: Mostly in upper deep cervical nodes and partly to the retropharyngeal nodes.

SURGICAL ANATOMY OF SOFT PALATE

Key Points

- It is a movable, muscular fold, suspended from the posterior border of the hard palate.
- It separates the nasopharynx from the oropharynx and it often looked upon as traffic controller at the cross roads between the food and air passages.
- Soft palate is fold of mucous membrane.

Muscles of Soft Palate

- Tensor palate (tensor veli palatine)
- Levator palate (levator veli palatine)
- Musculus uvulae
- Palatoglossus
- Palatopharyngeus

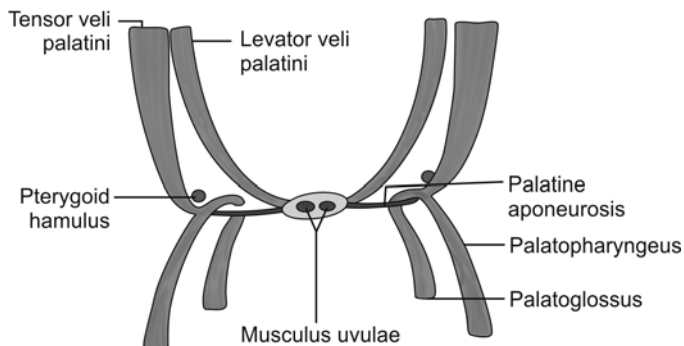


Fig. 2.19: Muscles of soft palate

Blood Supply

1. Arteries:
 - Greater palatine artery of maxillary artery
 - Ascending palatine branch of facial artery
 - Palatine branch of ascending pharyngeal artery.
2. Veins:
 - They pass to the pterygoid and tonsillar plexus of veins.
3. Lymphatics:
 - Drain into upper deep cervical and retropharyngeal lymph nodes.

Nerve Supply

1. Motor nerve:
 - All muscles of the soft palate except the tensor palate are supplied by the pharyngeal plexus.
 - The fibers of the plexus derived from the cranial part of the accessory nerve through the vagus.
 - Tensor palate is supplied by the mandibular nerve.
2. General sensory nerves are derived from:
 - a. The middle and posterior lesser palatine nerve.
 - b. The glossopharyngeal nerve.
3. Special sensory or gustatory nerves: The fibers travel through the greater petrosal nerve to the geniculate ganglion of the facial nerve.
4. Secretomotor nerves: They are derived from the superior salivatory nucleus and travel through the greater petrosal nerve.

SURGICAL ANATOMY OF FLOOR OF MOUTH

Various important structures are present:

- a. Wharton's duct
- b. Lingual nerve

- c. Sublingual artery
- d. Sublingual gland
- e. Hypoglossal nerve
- f. Submandibular gland

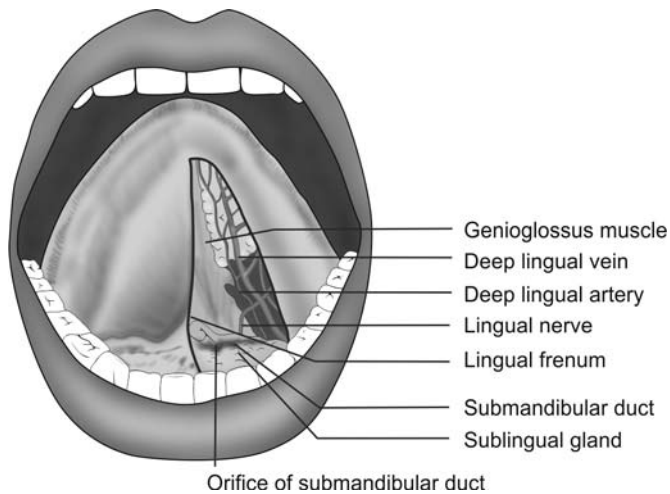


Fig. 2.20: Anatomy of floor of mouth

Wharton's duct or submandibular duct

- It exits from the superior aspect of the gland, coursing above the posterior free edge of the mylohyoid muscle between the inner surface of the mandible and the lateral surfaces of the hyoglossus and genioglossus muscle.
- The duct lies lateral to the hypoglossal nerve and it begins below the lingual nerve.
- The lingual nerve descends lateral to the duct.
- At this point, both the duct and the lingual nerve pass around the lower border of the sublingual gland and then are positioned medially.
- The lingual nerve continues to run below the duct and curls medially on the genioglossus muscle. This arrangement forms almost a complete loop.

- The Wharton's duct as it passes on the medial side of the sublingual gland, may receive the major sublingual duct or Bartholin's duct.
- The sublingual artery passes along the side of the genioglossus muscle between the muscle and the supplies both the gland and muscles of the tongue.
- The deep lingual artery runs more medially below the mucous membrane on the inferior surface of the tongue.
- Bleeding from either of these vessels may be brisk in superficial lacerations of the floor of mouth.

SURGICAL ANATOMY OF MANDIBULAR THIRD MOLAR

Key Points

- The lower wisdom tooth is situated at the distal end of the body of the mandible where it meet a relatively thin ramus.
- Fracture may occur if excessive force is applied (in case of horizontal impaction)
- The incision line distal to the second molar (or erupting third molar) should not extend backwards in medial direction because of the risk of damage to the lingual nerve.
- Below the root of third molar in the mandibular canal which is protected in the neurovascular bundle.
- Calcification of bony canal is completed before the root of the wisdom teeth are formed, therefore root may impinge upon the canal and neurovascular bundle may be torn during extraction of tooth.
- Sometime small retained root may be displaced from socket into the canal due to blind attempt or elevation of retained root.
- The mandible anterior to the line passing through the anterior margin of the masseter muscle is influenced by the depressor group of muscles while the ramus is influenced by the elevator group.
- External oblique line (ridge) is bulky and prominent in some patient.
- Behind the 3rd molar is a depressed roughened area, which is bounded by the lingual and buccal crest of the alveolar ridge, known as retromolar triangle.
- Retromolar triangle is a shallow, hollow depression retromolar fossa which is bounded by the anterior border of the ascending ramus and the retromolar crest.

Contd...

Contd...

- In either retromolar triangle or fossa, an opening may be present through which emerges branch of mandibular vessels which are distributed over the temporalis tendon, buccinators and alveolus.
- Sometimes, it may cause brisk hemorrhage. It can occur during surgical exposure of the third molar, if the incision is carried up the ramus and not taken laterally toward the cheek.
- The facial artery and anterior facial vein cross the anterior border of the masseter muscle (close to the 2nd molar).
- It is possible to cut these vessel if scalpel slip when making a buccal cut and therefore it is advisable incision in the depth of the sulcus and direct the blade upward toward the teeth.
- On inner aspect of the 3rd molar is the lingual nerve. It courses submucosally in contact with the periosteum. Great care must be taken to protect it.
- Neurotmesis of the lingual nerve may cause permanent anesthesia of the anterior 2/3rd of the tongue on the affected side.
- As the root lie in a proximity of the lingual plate, attempt of elevation of such root may displace through the thin lingual cortex into the lingual pouch.
- The tendinous insertion of the temporalis muscle extends from the coronoid process to the root of the ascending ramus and may reach the distal surface of the third molar. Stripping of these fibers during the removal of third molar can result in postoperative pain.
- Careless chisel blow lingually may lead to detachment of the lingual plate. Even lingual can be detached because it is only 25 mm away from distal surface of the 3rd molar.

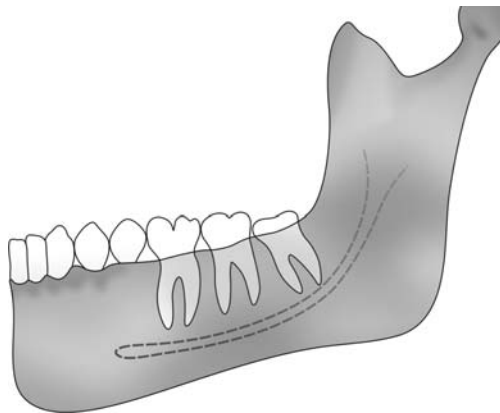


Fig. 2.21: Impacted mandibular 3rd molar

SURGICAL ANATOMY OF MIDDLE THIRD OF FACIAL SKELETON

- Introduction
- Physical characteristics of the middle third of facial skeleton.
- The articulation with the base of the skull
- Involvement of the brain and cranial nerves
- Involvement of the orbit
- Disturbance of the occlusion
- The paranasal sinus relationship
- Important blood vessels

Introduction

- The middle third of the facial skeleton is defined as:
“An area bounded superiorly by a line drawn across the skull from the zygomaticofrontal suture across the frontonasal and frontomaxillary suture to the zygomaticofrontal suture on the opposite side and inferiorly by the occlusal plane of the upper teeth or if the patient is edentulous by the upper alveolar ridge”.
- The middle third of facial skeleton is made up of the following bones:
 1. Two maxillae
 2. Two zygomatic bone
 3. Two zygomatic process of temporal bones
 4. Two palatine bones
 5. Two nasal bones
 6. Two lacrimal bones
 7. The vomer
 8. The ethmoid and its attached conchae
 9. Two inferior conchae
 10. The pterygoid plexus of sphenoid

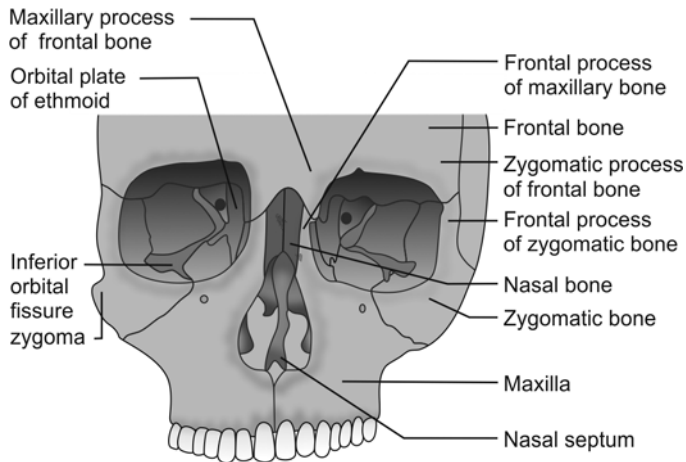


Fig. 2.22: Anatomy of middle third of facial skeleton

Physical Characteristics of the Middle Facial Skeleton

- The middle facial skeleton is made up of a considerable number of bones which are rarely, if ever fracture in isolation.
- The composite structure of this complex of bones is so ordered that it will withstand the forces of mastication from below and provide protection in certain areas for vital structure, e.g. eye
- Nahum (1973)—middle facial skeleton required 1/5th and 1/3rd of those required to produce simple fracture of the mandible.
- Because of relative fragility of middle facial skeleton, it acts as a cushion for trauma. It is analogous to a “Match Box”.

Articulation with the Base of the Skull

- If the bones comprising the middle facial skeleton are removed from the skull, it will be seen that the frontal bone and body of the sphenoid form an inclined plane.
- The pattern of fracture of these bones is however remarkably consistent and follows the lines of weakness within the face described by Guerin and LeFort. Severe trauma produces communication to particular bones of the nasoethmoidal complex and anterior maxillae.
- It is this inward crushing which produces the characteristic “Dishface” deformity rather than total posterior displacement.

Involvement of the Brain and Cranial Nerves

- LeFort II and III fracture and severe fracture of the nasal complex may lead to a dural tear in the region of the cribriform plate of the ethmoid resulting in CSF rhinorrhea.
- A dural tear may also occur adjacent to fracture involving the posterior wall of the frontal sinus.
- More rarely a profuse CSF rhinorrhea occurs as a result of a fracture which passes through the base of the sphenoidal sinus and via a crack in the roof of this structure with the middle cranial fossa.
- Damage to the infraorbital and zygomatic nerves may occur in zygomatic and LeFort II fracture. Recovery may take up to 2 years.
- Anterior, middle, posterior superior alveolar nerves are frequently damaged.
- Cranial nerve within the orbit may be damaged in zygomatic, LeFort II and III fracture.
- Frequently 6th cranial nerve (abducent) is damaged. Sometimes content of superior orbital fissure is damaged. It may cause ophthalmoplegia, dilation of the

pupil and anesthesia of distribution of the 5th cranial nerve. Ophthalmic branch is severely noted.

- Rarely the vertical apex is fractured with resultant damage to the optic nerve and blindness.

Involvement of the Orbit

- The globe of the eye and the optic nerve are remarkably well protected by the physical structure and arrangement of the bones of the orbit.
- The prominence of the zygomatic bone act as a protection for the globe.
- Optic foramen is a ring of compact bone and in high level or LeFort III injuries, fracture invariably pass around it. Rupture of globe or tearing of the optic nerve are fortunately rarely found.
- Fracture involving the orbit may give rise to alteration in the position of the globe of the eye. The level of the globe is normally maintained by the “Suspensory ligament of Lockwood”.
- Zygomatic and LeFort III fracture resulting drop in the level of the globe of the eye. As globe of the eye drops, the upper lid follows downwards giving rise to the physical sign known as hooding of the eye.
- If the bone comprising the floor of the orbit is fractured, orbital contents may herniate into the maxillary sinus below.
- Diplopia results mainly from interference with the activity of the ocular movement muscles rather than physical displacement of the globe.
- Orbital contents may also herniate through the thin lamina propria of the ethmoid bone on the medial wall of the orbit. Fracture of walls of the orbit may cause enophthalmos due to increase in orbital volume.
- LeFort II and III fracture and severe nasal complex injuries may involve the nasolacrimal duct with resulting epiphora.

- Detachment of the medial canthal attachment of the eye may occur in severe nasoethmoidal injuries, giving rise to traumatic telecanthus.
- Hemorrhage within the muscle cone of the eye “retrobulbar hemorrhage” can very rarely lead to loss of vision.
- It is thought that blindness occur as a result of spasm of the short posterior ciliary arteries, causing ischemia of the optic nerve head over a limited but critical area.

Disturbance of the Occlusion

- As the middle facial skeleton is pushed down, repositioning of the upper incisor and formation of an anterior open bite.
- The maxillae may be separated by a split of the bony palate usually but not always.
- Fracture of zygomatic arch, may cause impingement on the coronoid process, interfere with the normal range of excursion of the lower jaw.

Paranasal Sinuses

In zygomatic complex and LeFort I, II, III fracture, the maxillary sinuses are involved. Gross communication of the central walls occurs with bleeding into the cavity. This results in one or more antrum appearing opaque on radiological examination.

Important Blood Vessels

- The third part of the maxillary artery and its terminal branches are closely associated with the lines of fracture in LeFort I, II, III type injuries.
- Occasionally greater palatine artery in torn region of the pterygoid maxillary fissure or pterygopalatine canal resulting in severe life-threatening hemorrhage into the nasopharynx.

- Packing of the nose via the anterior nares if is effective, a post nasal pack must be inserted along with direct pressure to the bleeding point. It should be kept for 24 hours and replace if necessary.
- Adequate reduction of the fracture will fortunately prevent bleeding in most cases.

APPLIED SURGICAL ANATOMY OF MANDIBLE

Key Points

1. The mandible is the largest, heaviest and strongest bone of the face.
2. Even though, it is very strong structure it is prone to injury because of its prominent position in the facial skeleton.
3. The body of the mandible has got horse shoe or parabola shape.
4. Two rami project upward from the posterior aspect of the body.
5. The condylar process of these rami articulate with the temporal bone to form the temporomandibular joint.
6. Mandible is strong at its center and weakest at its ends where it often breaks.
7. The adult mandible is composed of a outer compact bone and inner plate of cortical bone and a central portion of medullary bone (spongiosa) whose trabeculae are distributed along the lines of maximum stress.
8. The lower portion of the body is heavy and thick and consists of dense cortical bone with little spongiosa.
9. The alveolar process has lingual and buccal plate of compact but thin bone.
10. After total extractions due to extreme atrophy, the mental foramen almost comes at the margin of the crest of the ridge.
11. On the lateral surface: The strong external oblique ridge extend from the body obliquely upward to the anterior border of the ramus.
12. Medial surface is thinner than the lateral surface but it is also composed of dense, thick compact cortex.
13. The mylohyoid line extends from the area of the socket of the third molar diagonally downward and forward toward the genial tubercles at the midline.
14. The ramus consists essentially of two thin plates of compact bone. The posterior border of the ramus is strong and rounded.
15. The bony trajectories transmit and disperse the forces of mastication toward the condyle from the body, thus preventing injury to middle cranial fossa.

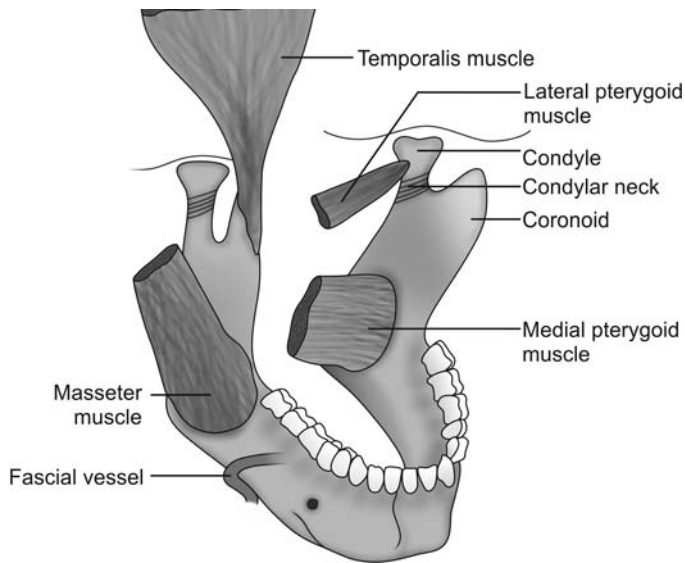


Fig. 2.23.: Anatomy of mandible (muscle attachments)

Areas of Weakness

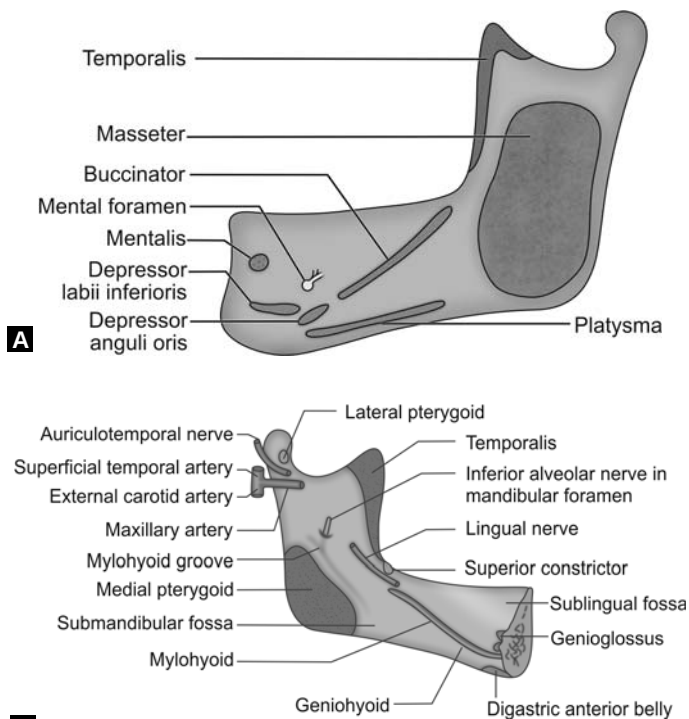
- The junction of the alveolar bone and basal mandibular bone creates a line of weakness.
- Symphysis region is formed by the bony union of two halves in the center.
- Parasymphysis region lateral to the mental prominence is naturally weak area because of presence of incisive fossa and mental foramen.
- Junction of body and ramus of mandible, angle fracture are commonly seen due to the curvature of trajectories in this region.
- In advanced age, loss of teeth, resorption of alveolar bone results in decrease in the vertical height of the mandible, making it prone to fracture.

Blood Supply

- Central blood supply through the inferior alveolar artery.
- Peripheral blood supply through the periosteum.

Nerve Supply

Mainly from inferior alveolar nerve with mental, incisive, lingual, mylohyoid nerve.



Figs 2.24A and B: Surgical anatomy of mandible

Muscle Action

The muscles originating from the inner aspect of the mandible-mylohyoid, geniohyoid, genioglossus and anterior belly of diaphragm. The fractured fragments tend to collapse posteriorly or medially.

The lateral pterygoid muscle is inserted into the medial fossa of the condyle. In condyle fracture head is displaced anteriorly and medially and may also undergo lateral rotation due to spasm of the muscle.

SURGICAL ANATOMY OF THYROID GLAND

Introduction

- Thyroid gland is an endocrine gland situated in the lower part of the front and sides of the neck. It regulates basal metabolic rate (BMR).
- It stimulates somatic and psychic growth and play an important role in calcium metabolism.
- The gland consists of right and left lobes that joined to each other by the isthmus.
- A third pyramidal lobe may project upwards from the isthmus.
- Accessory thyroid gland are sometimes found as small detached masses.

Situation and Extent

- The gland lies against vertebrae C5, C6, C7, T1, embracing the upper part of the trachea.
- Each lobe extend from the middle of the thyroid cartilage to the 4th or 5th tracheal ring.
- The isthmus extends from the 2nd to 4th tracheal ring.

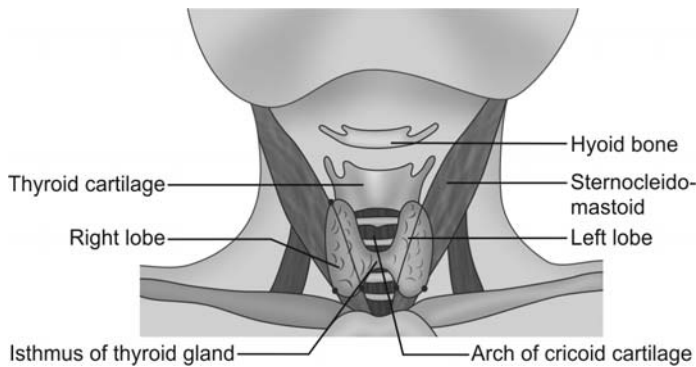


Fig. 2.25: Anatomy of thyroid gland

Dimension and Weight

- Each lobe measure 5 cm × 2.5 cm × 2.5 cm
- Isthmus 1.2 cm × 1.2 cm
- Average gland weighs about 25 gm.
- It is larger in female than male. It increases in size during menstruation and pregnancy.

Capsule of the Thyroid

- The true capsule is the peripheral condensation of the connective tissue of the gland.
- The false capsule is derived from the pretracheal layer of the deep cervical fascia.
- The dense capillary plexus is present deep to the true capsule.

Relations

- The lobes are conical in shape having an:
 - a. An apex
 - b. A base
 - c. Three surfaces: Lateral, medial, posterolateral
 - d. Two borders: Anterior, posterior.

- The apex is directed upward and slightly laterally. It is limited superiorly by attachment of the sternothyroid to the oblique line of the thyroid gland.
- The base is on the level with 4th or 5th tracheal ring.
- The lateral surface is covered with:
 - i. Sternohyoid
 - ii. The superior belly of the omohyoid
 - iii. The sternothyroid
 - iv. Anterior border of the sternocleidomastoid.
- The medial surface is related to:
 - i. Two tubes: Trachea and esophagus
 - ii. Two muscles: Inferior constrictor and cricothyroid
 - iii. Two nerves: External laryngeal and recurrent laryngeal.
- Posterior or posterolateral surface is related to the carotid sheath and overlaps the common carotid artery.
- Anterior border is thin. It is related to the anterior branch of the superior thyroid artery.
- Posterior border is thick and rounded. It is related to the:
 - i. Inferior thyroid artery
 - ii. Anastomosis between the superior and inferior thyroid arteries.
 - iii. Parathyroid gland
 - iv. Thoracic duct.
- Isthmus has:
 - i. Two surfaces: Anterior and posterior
 - ii. Two border: Superior and inferiorOccasionally isthmus is absent.

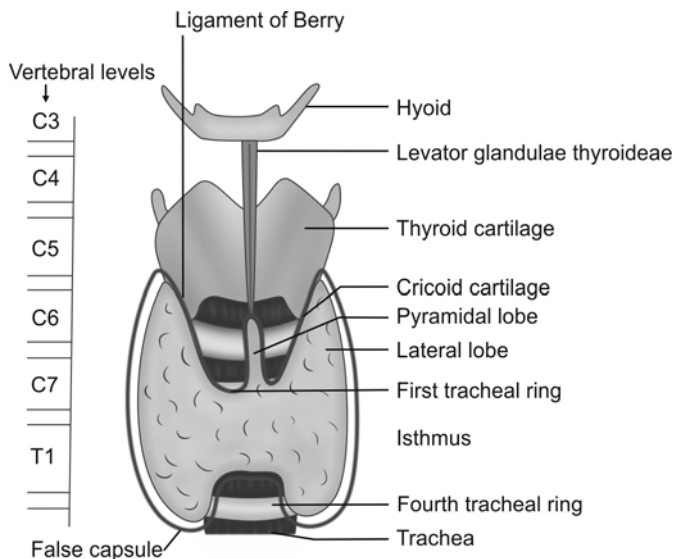


Fig. 2.26: Applied anatomy of thyroid gland

Arterial Supply

- The thyroid gland is supplied by superior and inferior thyroid arteries.
- Superior thyroid artery supplies the upper 1/3rd of the lobe and upper half of the isthmus.
- Inferior thyroid artery supplies lower 2/3rd of the lobe and lower half of the isthmus.
- Sometimes in 30 percent of individuals the thyroid is also supplied by the lowest thyroid artery known as thyroidea ima artery.

Venous Drainage

- The thyroid is drained by the superior/middle and inferior thyroid vein.

- They form a plexus in front of the trachea and drain into the left brachiocephalic vein.
- A fourth thyroid vein of kocher may emerge between the middle and inferior veins and drain into the internal jugular vein.

Lymphatic Drainage

- Lymph from upper part of the gland reaches the upper deep cervical lymphnodes either directly or through the prelaryngeal nodes.
- Lymph from the lower part of the gland drains to the lower deep cervical nodes directly and also through the pretracheal and paratracheal nodes.

Nerve Supply

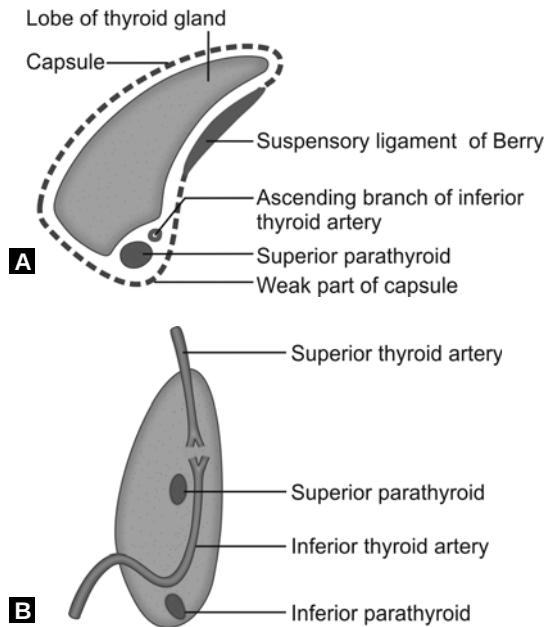
Nerves are derived mainly from the middle cervical ganglion and partly also from superior and inferior cervical ganglion. These are vasoconstrictor.

SURGICAL ANATOMY OF PARATHYROID GLAND

- These are two pairs (superior and inferior) of small endocrine gland, that usually lie on the posterior border of the thyroid gland.
- The superior parathyroid are also referred to as parathyroid IV because they develop from the endoderm of the 4th pharyngeal pouch.
- The inferior parathyroid similarly are also called as parathyroid III because they develop from the third pouch.
- The parathyroid secrete parathormone which controls metabolism of calcium and phosphorus along with thyrocalcitonin.
- Shape is oval. It measures $6 \times 4 \times 2$ cm and weighs about 50 gm.

Position

- The anastomotic artery between the superior and inferior thyroid arteries is usually a good guide to the gland because they usually lie close to it.
- The superior parathyroid is more constant in position. The inferior parathyroid is more variable in position.



Figs 2.27A and B: Anatomy of parathyroid gland

Vascular Supply

Receive rich blood supply from the “Inferior thyroid artery” and from the anastomosis between the superior and inferior thyroid arteries.

Venous and Lymphatics

- It is associated with those of thyroid gland—thyroid vein.
- Lymphatic drainage from upper deep cervical nodes and lower deep cervical nodes and also through pre and paratracheal nodes.

Nerve Supply

- Vasomotor nerves are derived from the middle and superior cervical ganglion directly or through the inferior thyroid plexus.
- Parathyroid activity controlled by blood calcium levels.

DEEP STRUCTURES IN THE NECK

There are numerous deep structures in the neck:

- A. Glands: Thyroid and parathyroid gland
- B. Thymus
- C. Arteries: Subclavian and carotid
- D. Vein: Subclavian, internal jugular vein and brachiocephalic
- E. Nerves: Glossopharyngeal (IX), vagus (X), accessory (XI), hypoglossal (XII), sympathetic chain, cervical plexus.
- F. Lymph nodes and thoracic duct
- G. Viscera: Trachea and esophagus
- H. Muscles: Scalene muscles
- I. Cervical pleura and suprapleural membrane.
- J. Styloid apparatus.

Chapter

3

Musculature (Head and Neck Region)

🔑 Chapter Outline

- Muscles
- Facial Muscles or Muscles of Facial Expression
- Muscles of Mastication
- Muscles of Tongue
- Muscles of Orbit
- Muscles of Soft Palate
- Muscles of Pharynx
- Muscles of Larynx
- Muscles of Ear
- Muscles of Neck
- Muscles of Back of the Neck

MUSCLES

General Description

Derivation of nerve: Muscles are so named because many of them resemble a mouse with their tendons representing the tail.

Definition: Muscle is a contractile tissue which brings about movement.

Types of muscles

- A. Skeletal (Voluntary somatic) muscle:** Contract with great rapidity but more easily fatigued.
Example: Limb muscle and body wall muscles.

- Found attached to the under voluntary control help to adjusting the individual to external environment supplied by somatic nerve example are limb muscle and body wall muscle.

B. Smooth (Involuntary/visceral plane) muscle:

- Contraction slow does not get easily fatigue
- Innervated with autonomic nerves
- Not under voluntary control
For example, Muscles of digestive/urinogenital/circulatory system

C. Cardiac muscle: It forms myocardium of heart

- Intermediate instructor meant for automatic and rhythmic contraction of the heart.

FACIAL MUSCLES OR MUSCLES OF FACIAL EXPRESSION

- A. Muscles of the scalp occipitofrontalis
- B. Muscles of the auricle (situated around the ear):
 1. Auricularis anterior
 2. Auricularis superior
 3. Auricularis posterior
- C. Muscles of the eyelids:
 1. Orbicularis oculi
 2. Corrugator super cilli
 3. Levator palpebrae superioris
- D. Muscles of nose:
 1. Procerus
 2. Compressor septi
 3. Dilator naris
 4. Depressor septi
- E. Muscles around the mouth:
 1. Orbicularis oris
 2. Levator labii superioris alaequae nasi
 3. Zygomaticus minor
 4. Levator labii superior

5. Levator anguli oris
 6. Zygomaticus minor
 7. Depressor anguli oris
 8. Depressor labii inferioris
 9. Mentalis
 10. Risorius
 11. Buccinator
- F. Muscles of neck
Platysma

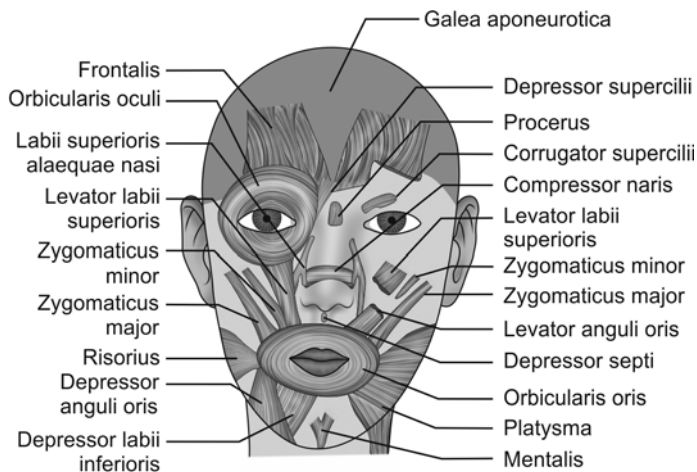


Fig. 3.1: Facial muscles

Individual Action of Different Facial and Muscle

Action

Smiling and laughing
Sadness

Grief

Anger

Muscle

Zygomaticus major
Levator labii superioris
Levator angulioris
Depressor angulioris
Dilator naris and
depressor septi

Frowning	Corrugator supercilli
	Procerus
Horror, terror and fright	Platysma
Surprise	Frontalis
Doubt	Mentalis
Grinning	Risorius
Contempt	Zygomaticus minor
Closing of mouth	Orbicularis oris
Whistling	Buccinator, orbicularis oris

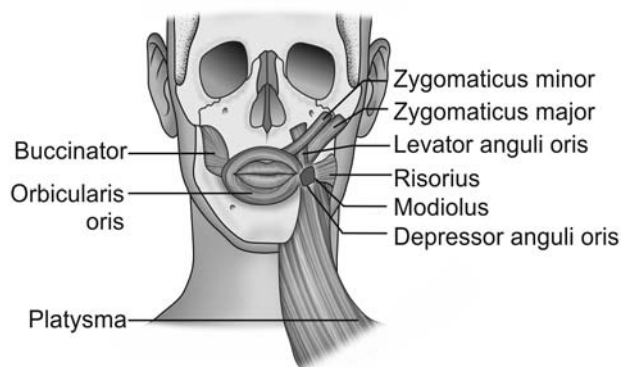


Fig. 3.2: Facial muscles

Clinically Muscles Action Examined by

Muscle	
Frontalis	Horizontal wrinkles of the Forehead
Corrugator supercilli	Frowning and making vertical wrinkles of the forehead
Buccinator	Putting of mouth and blowing forcibly as in whistling
Platysma	Forcibly pulling of the angles of the mouth and backwards forming prominent vertical fold of the side of the neck.

Orbicularis Oris

- a. Intrinsic part—deepest-stratum very thin sheet.

Origin: Superior incisivus from maxilla, inferior incisivus from mandible.

Insertion: Angle of mouth.

- b. Extrinsic part—two strata formed by converging muscles.

Origin: Thickest middle stratum derived from buccinators. Thick superficial stratum derived from elevator and depressor of lips and their angle.

Insertion: Lips and angle of the mouth.

Action: Closes and purses the mouth Numerous extrinsic muscles make it most versatile for various type of grimaces.

Nerve Supply: Temporal branch of facial nerve.

Buccinator

Muscles of the Cheek

Origin:

- I. Upper fibers from maxilla opposite molar teeth.
- II. Lower fibers from mandible opposite molar teeth.
- III. Middle fibres from Pterygomandibular raphae.

Insertion: Upper fibres straight to the lower lip middle fibres decussate before passing to the lips

Action: Flatens cheek against gums and teeth prevent accumulation of two in the vestibule. This is a whistling muscle.

Corrugator Supercilii

Origin: Medial end of supercilliary arch

Insertion: Skin of mid eyebrow

Action: Vertical lines in forehead: Frowning.

Orbicularis Oculi

Mainly three part:

- Orbital part: On and around the orbital margin
- Palpebral part: In the lids
- Lacrimal part: Lateral and deep to the lacrimal sac.

Origin:

- Orbital part: Medial part of medial palpebral ligament and adjoining bone
- Palpebral part: Lateral part of medial palpebral ligament
- Lacrimal part: Lacrimal fascia and lacrimal bone.

Insertion:

- Orbital part: Concentric rings return to the point of origin
- Palpebral part: Later palpebral raphe
- Lacrimal part: Dilates lacrimal sac directs lacrimal puncta into lacus lacrimalis. Support the lower lid.

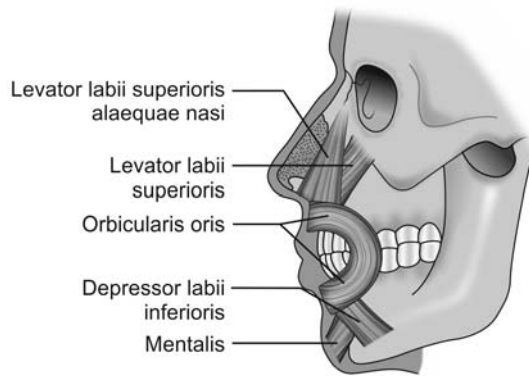


Fig. 3.3: Facial muscles

Mentalis

Mentalis is a very prominent and thick but short length muscle of facial expression located at chin.

Origin: Muscle has broad origin from symphysis menti region.

Insertion: Into the skin of the chin region.

Action: Shows facial expression: "Doubt".

MUSCLES OF MASTICATION

- A. Principal (main) muscles:
 - 1. Masseter muscle
 - 2. Temporalis muscle
 - 3. Medial pterygoid muscle
 - 4. Lateral pterygoid muscle
- B. Accessory muscles:
 - I. Suprahyoid
 - 1. Digastric
 - 2. Mylohyoid
 - 3. Stylohyoid
 - 4. Geniohyoid
 - II. Infrahyoid
 - 1. Sternohyoid
 - 2. Sternothyroid
 - 3. Thyrohyoid
 - 4. Omohyoid
- C. Platysma muscle.

Principal (Main) Muscles*Masseter Muscle*

Quadrilateral–Cover lateral surface of ramus of the mandible. It has three layers:

- I. Superficial
- II. Middle
- III. Inner layer

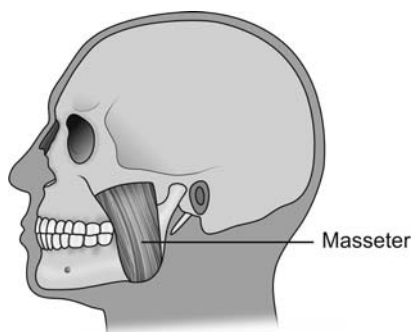


Fig. 3.4: Masseter muscle

Origin:

- I. Superficial layer (Largest):** From anterior two-third of lower border of zygomatic arch and adjoining zygomatic process of maxilla.
- II. Middle layer:** From anterior two-third of deep surface and post one-third of lower border of zygomatic arch.
- III. Deep layer:** From deep surface of zygomatic arch.

Insertion:

Superficial layer: Into lower part of surface of ramus of mandible.

Middle layer: Into middle part of ramus

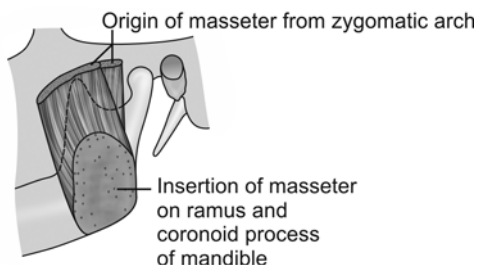


Fig. 3.5: Origin and insertion of masseter muscle

Deep layer: Into upper part of ramus and coronoid process of mandible.

Nerve supply: Masseteric nerve.

Actions: Elevates mandible to close the mouth to bite.

Temporalis Muscle

Fan shaped fills the temporal fossa:

- I. Temporal fossa [excluding zygomatic bone]
- II. Temporal fascia

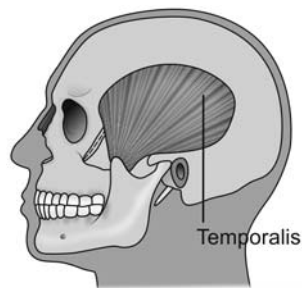


Fig. 3.6: Temporalis muscle

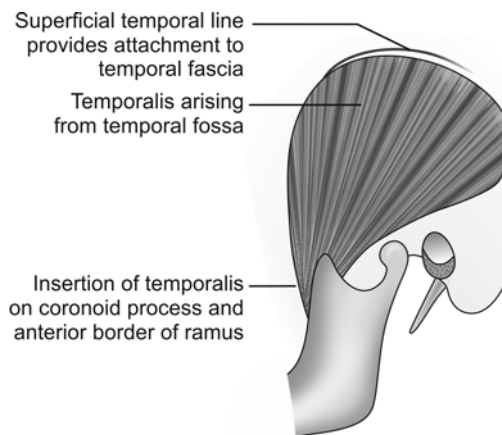


Fig. 3.7: Origin and insertion of temporalis muscle

Insertion: Marginal deep surface of coronoid process anterior border of ramus of mandible.

Nerve supply: Deep temporal nerve.

Actions:

- I. Elevate the mandible
- II. Help in side to side grinding movement.

Medial Pterygoid Muscle

Quadrilateral

Has abnormal superficial and large deep head.

Origin: Superficial head (small) from tuberosity of the maxilla.

Deep large from the medial surface of lateral pterygoid plate and adjoining process of palatine bone.

Insertion: Rough head area on the medial surface of angle and adjoining ramus of mandible.

Below and behind the mandibular foramen and mylohyoid groove.

Action: To elevate the mandibular help protrude mandible.

Nerve supply: Nerve to medial pterygoid.

Lateral Pterygoid Muscle

Short conical has upper and lower heads.

Origin: Upper head (small) from intratemporal surface and crest of greater wing of sphenoid bone.

Lower head (large) from lateral surface of pterygoid plate.

Insertion: Pterygoid fovea on the anterior surface of neck of mandible.

Anterior margin of articular disc and capsule of TMJ.

Nerve Supply: Nerve to lateral pterygoid.

Action:

- I. To depress the mandible
- II. To open the mouth

- III. To protrude the mandible
IV. Part of grinding movement.

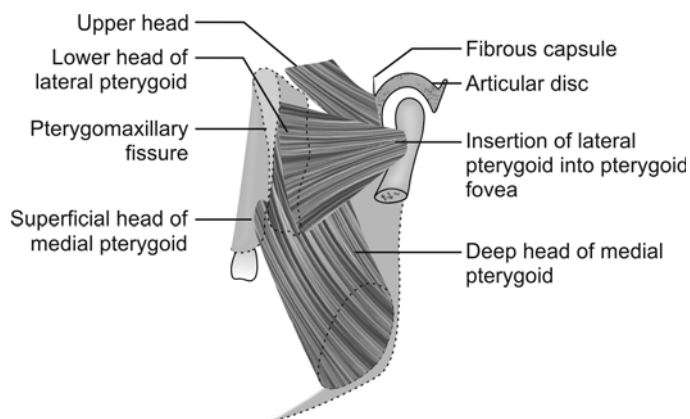


Fig. 3.8: The lateral and medial pterygoid muscle

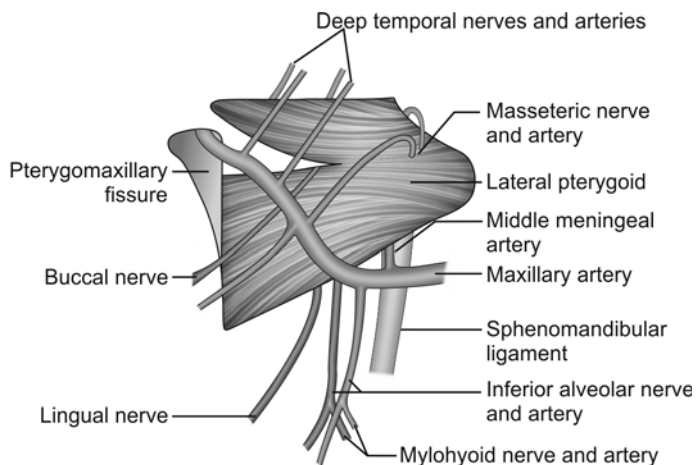


Fig. 3.9: Relations of lateral pterygoid muscle

Accessory Muscles

I. Suprahyoid

1. **Digastric Muscle:** Has two bellies anterior and posterior belly united by intermediate tendon.

Origin: Anterior belly from digastrics fossa of the mandible post belly from mastoid notch of temporal bone.

Insertion: Both heads meets at the intermediate tendon which perforate stylohyoid (SH) is held by fibrous pulley to the hyoid bone.

Nerve supply: Anterior belly by nerve to mylohyoid post belly by facial nerve.

Action:

- a. Depresses mandible when mouth is open widely or against resistance
- b. Elevate hyoid bone.

2. **Mylohyoid Muscle:** Flat triangular two myloid form floor of mouth cavity deep to anterior belly of digestive muscle.

Origin: Mylohyoid line of mandible.

Insertion: Post fibers body of hyoid bone middle and anterior fiber median raphe between mandible and hyoid bone.

Nerve supply: Nerve to mylohyoid.

Action:

- I. Elevates floor of mouth in first stage of deglutition
- II. Helps in depression of mandible
- III. Elevation of hyoid bone.

3. **Stylohyoid:** Small muscle lies on upper border of digastrics post belly.

Origin: Post surface of styloid process.

Insertion: Junction of the body and greater cornua of hyoid bone.

Nerve Supply: Facial nerve.

Action:

- I. Pulls hyoid bone upward and backward
- II. With other hyoid muscle it fixes the hyoid bone.

4. **Geniohyoid:** Short and narrow muscle lies above medial part of the mylohyoid.

Origin: Inferior mental spine (genial tubercle).

Insertion: Anterior surface of body of hyoid bone.

Nerve Supply: Hypoglossal nerve.

Action: Elevate hyoid bone may depress mandible when hyoid is fixed.

II. Infrahyoid muscle

1. Sternohyoid

Origin:

- a. Post surface of manubrium sterni.
- b. Adjoining parts of the clavicle and the post sterno clavicular ligament.

Insertion: Medial part of lower border of hyoid bone.

Nerve Supply: Ansa cervicalis.

Action: Depresses the hyoid bone following its elevation during swallowing and during vocal movements.

2. Sternothyroid: It lies deep to the sternohyoid.

Origin:

- a. Post surface of manubrium sterni.
- b. Adjoining part of costal cartilage.

Insertion: Oblique line on the lamina of the thyroid cartilage.

Nerve Supply: Ansa cervicalis.

Action: Depresses the larynx after it has been elevated in swallowing and in vocal movement.

3. Thyrohyoid: It lies deep to sternohyoid.

Origin: Oblique line of thyroid cartilage.

Insertion: Lower border of the body and the greater cornua of the thyroid of the cartilage.

Nerve Supply: C1 through hypoglossal nerve.

Action:

- I. Depresses the hyoid bone
- II. Elevates the larynx when the hyoid is fixed to the suprahyoid muscle.

4. **Omoxyoid:** It has an inferior belly a common tendon and a superior belly. It arises by the inferior belly and is inserted through the superior belly.

Origin: Upper border of scapula near the suprascapular notch adjoining part of suprascapular ligament.

Insertion:

- a. Lower border of body of hyoid bone lateral to the sternohyoid
- b. The central tendon lies on the internal view at the level of the cricoid cartilage and is bound to the clavicles by a fascial pulley.

Nerve supply:

- a. Superior belly by the superior root of the ansa cervicalis
- b. Inferior belly by ansa cervicalis.

Action: Depresses the hyoid bone following its elevation during swallowing and invocal movements.

Platysma Muscles

- Muscle of neck
- Play role in facial expression and mastication.

Origin: Upper parts of pectoral and deltoid fasciae.

Insertion: Fibers run upwards and medially

- Anterior fibers to the base of the mandible
- Post fibers to skin the lower face and lip and continuous with the risorius.

Action: Depresses the mandible and pulls the angle of mouth (mastication) downwards as in horror or surprise (facial expression).

Nerve supply: Cervical branch facial nerve.

MUSCLES OF TONGUE

Each half contains four intrinsic and four extrinsic muscles

- A. Intrinsic muscles:
1. Superior longitudinal
 2. Inferior longitudinal
 3. Transverse muscle
 4. Vertical muscle
- B. Extrinsic muscles:
1. Genioglossus
 2. Hyoglossus
 3. Styloglossus
 4. Palatoglossus.

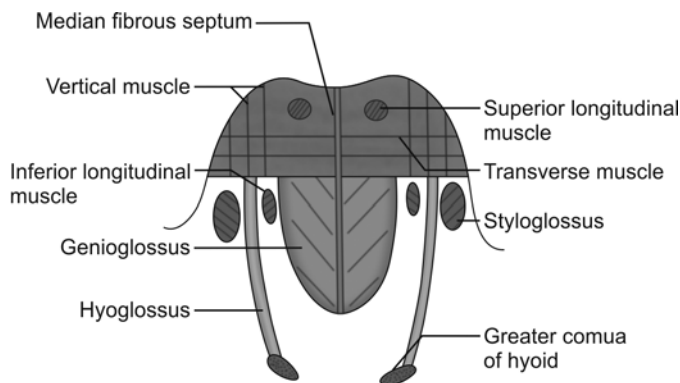


Fig. 3.10: Coronal section of tongue showing arrangement of intrinsic and extrinsic muscle

Intrinsic Muscles

- Occupy the upper part of the tongue
 - They alter the shape of the tongue.
1. **Superior longitudinal:** It lies beneath the mucous membrane.
Action: It shortens the tongue makes its dorsum concave.

2. **Inferior longitudinal:** It is a narrow band lying close to the inferior surface of the tongue between the genioglossus and the hyoglossus.

Action: It shortens the tongue makes the dorsum convex.

3. **Transverse muscle:** Extends from the median septum to the margins.

Action: It makes the tongue narrow and elongated.

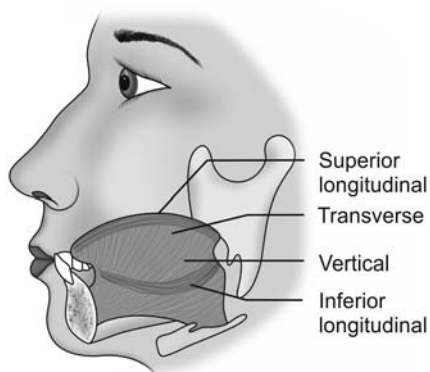


Fig. 3.11: Intrinsic muscle of tongue

4. **Vertical muscle:** It found at the borders of the anterior part of the tongue.

Action: It makes the tongue broad and flattened.

Extrinsic Muscles

Connect the tongue to the genioglossus to the hyoid bone. Through hyoglossus to the styloid process via styloglossus to the palate via palatoglossus.

1. **Genioglossus:** It is a fan shaped muscle which forms the main bulk of tongue.

Origin: It arise from the upper genial tubercle of mandible.

Insertion:

- a. The upper fibers are inserted into the tip.
- b. Middle fibers into the dorsum.
- c. Lower fibers into the hyoid bone.

Nerve supply: Hypoglossus

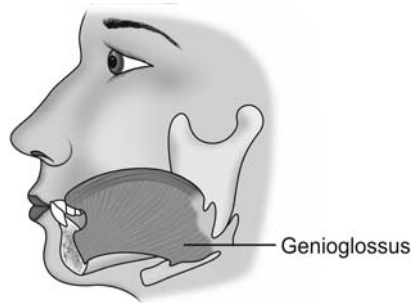


Fig. 3.12: Genioglossus

Action: Upper fiber retract the tip middle fiber depress the tongue lower fiber—pull the posterior part of the tongue forward and thus protrude the tongue from the mouth.

Special note: The muscle if paralysed, tongue will fall back on the oropharynx and block the main passage.

2. **Hyoglossus:** One of the suprahyoid muscle—muscle of tongue.

Origin: Whole length of greater cornua and lateral part of body of hyoid bone.

Insertion: Side of tongue between styloglossus and inferior longitudinal muscle and tongue.

Nerve supply: Hypoglossus nerve.

Action:

- I. Depresses tongue
- II. Makes dorsum convex
- III. Retract the protruded tongue.

3. **Styloglossus:** Arises from the tip and adjacent part of the anterior surface of styloid process as well as from the upper end of the stylohyoid ligament.

Insertion: Into the side of tongue

Nerve supply: Hypoglossal nerve

Action: During swallowing it pulls the tongue backward and upwards.

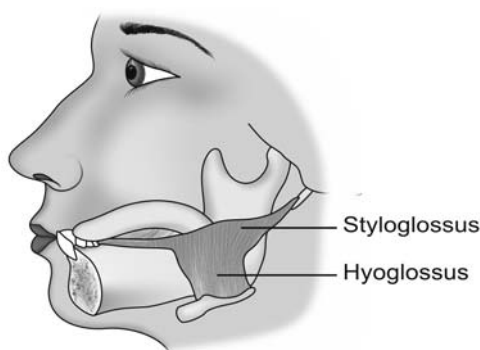


Fig. 3.13: Hyoglossus and styloglossus

4. **Palatoglossus** (muscles of soft palate and tongue)
Origin: Oral surface of palatine—aponeurosis
Insertion: Descends in the palatoglossal arch to the side of the tongue at the junction of the oral and pharyngeal part.
Nerve supply: Accessory nerve (IX Cranial nerve)
Action:
- Pulls up the root of the tongue
 - Approximates the palatoglossal archs and thus closes the oropharyngeal isthmus.

MUSCLES OF ORBIT

Extraocular muscles:

1. Recti muscle:

- a. Superior rectus
- b. Inferior rectus
- c. Medial rectus
- d. Lateral rectus
2. Oblique muscle:
 - a. Superior oblique
 - b. Inferior oblique
3. The levator palpebra superioris:
 - A. Involuntary muscle
 - a. Superior tarsal
 - b. Inferior tarsal muscle
 - c. Orbitalis
 - B. Voluntary muscles – Four recti muscle

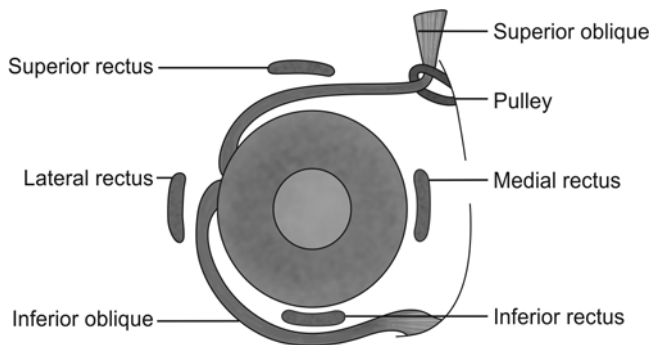


Fig. 3.14: Insertion of oblique muscles of the eyeball

Recti Muscle

Origin: Four recti arises from a common annular tendon or tendinous ring.

This ring is attached to the orbital surface of the apex of the orbit.

Insertion: Recti are inserted into the sclera a little posterior to limbus.

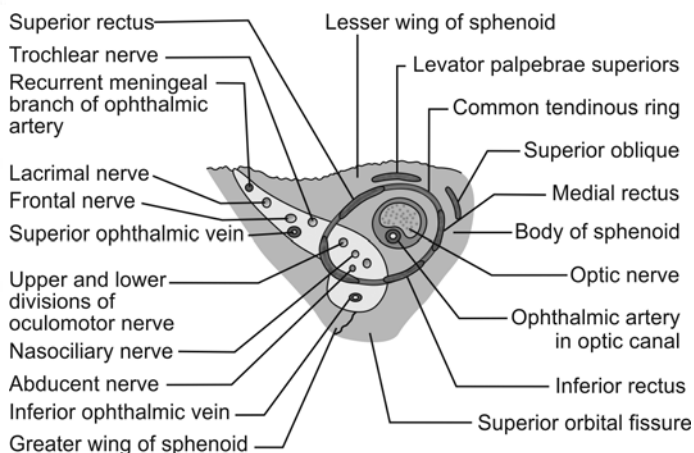


Fig. 3.15: Apical part of the orbit showing origin of extraocular muscles

Nerve supply:

Inferior Rectus = Depression/Adduction medial rotation

Abduction Lateral rotation

Superior rectus = In primary position

Elevation/Adduction/Abduction

Medial rectus = In primary position only adduction (medial rotation)

Lateral rectus = In primary position

Only abduction = Only lateral rotation.

Oblique Muscle

Origin: Superior oblique muscle: Arises from the body of the sphenoid superomedial to the optic canal.

Inferior oblique muscle: Arise from the orbital surface of maxilla.

Insertion: Superior oblique muscle—it is inserted into the sclera behind the eyeball.

Inferior oblique inserted close to the superior oblique a little below post to the latter.

Nerve supply: Superior oblique supplied by the fourth cranial nerve (trochlear nerve).

Inferior oblique muscle supplied by third cranial nerve (oculomotor).

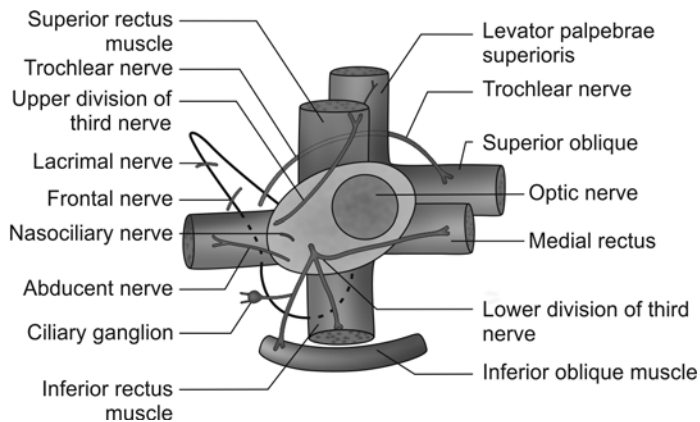


Fig. 3.16: Nerve supply of extraocular muscles

Action:

Superior oblique = In primary position

Depression/Abduction/Intorsion

Inferior oblique = In primary position

Elevation/Abduction/Extorsion.

Levator Palpebrae Superioris

Origin: Arise from orbital surface of the lesser wing of the sphenoid bone.

Insertion: Anterior surface of the superior tarsus into the upper eyelid.

Nerve supply: Third cranial nerve oculomotor.

Action: Elevate the upper eyelid.

Involuntary Muscles

Superior Tarsal Muscle

Origin: It is the deeper portion of the levator palpebra superioris.

Insertion: It is inserted onto the upper margin of the superior tarsus.

Action: It elevates the upper eyelid

Inferior Tarsal Muscle

Extend from the facial sheath of the inferior rectus and the inferior oblique.

Insertion: To the lower margin of inferior tarsus.

Action: It possibly depresses lower eyelid.

The Orbitalis: Bridges the inferior orbital tissue.

Action: Its action is uncertain.

MUSCLES OF SOFT PALATE

They are as follows:

1. Tensor Palatine (Tensor veli palatine)
2. Levator Palatine (Levator veli palatine)
3. Musculus uvulae
4. Palatoglossus
5. Palatopharyngeous

1. Tensor palatine (Tensor veli palatine)

Thin triangular muscle.

Origin:

- a. Lateral side of auditory tube
- b. Adjoining part of the base of the skull (greater wing and scaphoid fossa of sphenoid bone).

Insertion:

- a. Posterior border of the hard palate
- b. Inferior surface of palate behind the palatine crest.

Action: Tightens the soft palate (Anterior)—opens the auditory tube to equalize air pressure between the middle ear and the naropharynx.

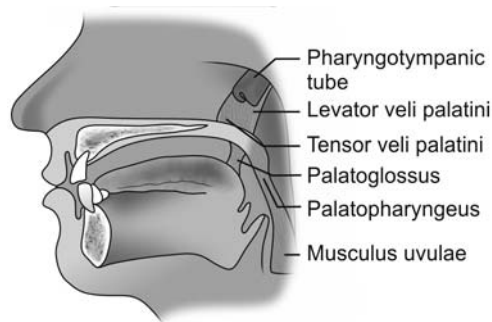


Fig. 3.17: Muscles of soft palate

2. Levator palatine (Levator veli palatine)

Cylindrical muscle lies deep the tensor palate.

Origin:

- Inferior aspect of auditory tube
- Adjoining part of inferior surface of the petrous temporal bone.

Insertion: Inserted into the upper surface of the palatine aponeurosis.

Action:

- Elevate soft palate and closes the pharyngeal isthmus
- Open the auditory tube like the tensor veli palatine.

3. Musculus uvulae

This is longitudinal strip placed on one side of the median plane within the palatine aponeurosis.

Origin:

- Post nasal spine
- Palatine aponeurosis.

Insertion: Mucous membrane of uvula.

Action: Pulls up the uvula.

4. Palatoglossus

Origin: Oral surface of palatine aponeurosis.

Insertion: Descends in the palatoglossus arch, to the side of the tongue at the junction of the oral and pharyngeal part.

Action: Pulls up the root of the tongue

- Approximates palatoglossal arches and thus closes the oropharyngeal isthmus.

5. **Palatopharyngeus**

It consists of two fasciculi that are separated by the elevator veli palatine.

Insertion: Posterior border of the lamina of the hyoid cartilage wall of the pharynx and its median raphe.

Origin: Anterior fascial from posterior border of the hard palate posterior fascial from the palatine aponeurosis.

Action: Pulls up the wall of the pharynx and shortens during swallowing.

Nerve Supply: All the muscles of soft palate except tensor palate supplied by the pharyngeal plexus derived from accessory nerve (XI CN) through vagus nerve.

Tensor palate is supplied by mandibular nerve.

MUSCLES OF PHARYNX

- A. Three pairs constrictor muscles:
 1. Superior constrictor
 2. Middle constrictor muscle
 3. Inferior constrictor muscle
- B. Longitudinal muscle coat of the pharynx:
 1. Stylopharyngeus
 2. Salpingopharyngeus
 3. Palatopharyngeus

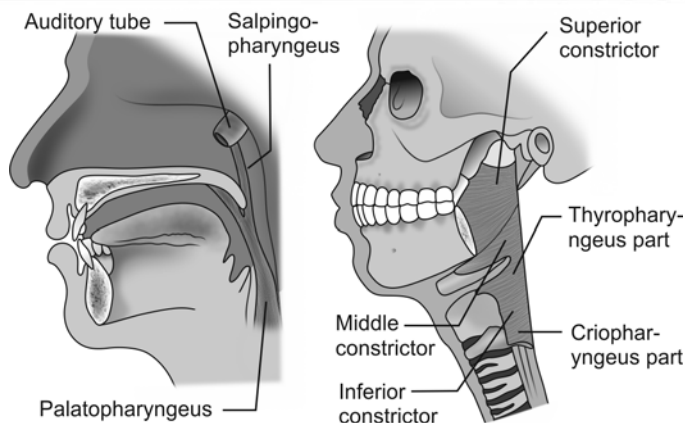


Fig. 3.18: Muscles of pharynx

Constrictor Muscles

1. Superior constrictor muscle:

Origin:

Take origin from the following:

From above to downwards

- a. Pterygoid hamulus
- b. Pterygomandibular raphe
- c. Medial surface of the mandible at the posterior end of the mylohyoid line
- d. Side of posterior part of tongue.

2. Middle constrictor muscles:

Take origin from:

- a. Lower part of stylohyoid ligament
- b. Lesser cornua of hyoid bone
- c. Upper border of the greater cornua of the hyoid bone.

3. Inferior constrictor muscle:

Consists two pairs

- a. Thyropharyngeus
- b. Cricopharyngeus

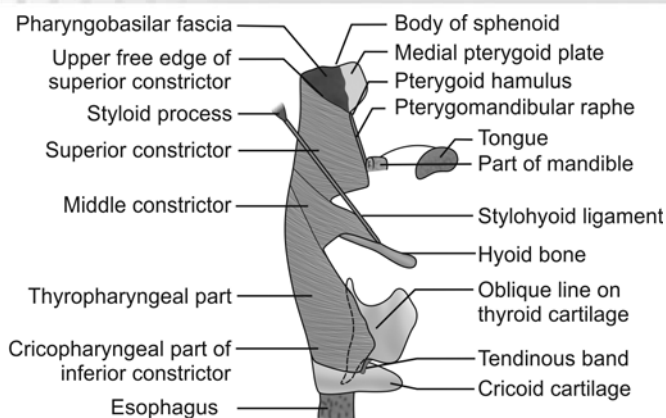


Fig. 3.19: Origin of constrictors of the pharynx

One from the thyroid cartilage

Other from the cricoid cartilage

Insertion of constrictor muscle

Into median raphe on the posterior wall of the pharynx.

Nerve Supply: Motor fibers are derived from the cranial accessory nerve through the branches of the vagus. They supply all muscles of pharynx. Except the stylopharyngeus which is supplied by the glossopharyngeal nerve.

Longitudinal Muscle of Pharynx

Run longitudinally

Stylopharyngeus arise from styloid process.

It passes through the gap between the superior and the middle constrictor muscle to run downward on the inner surface of the middle inferior constrictors.

Salpingopharyngeus descends from the auditory tube to merge with palate to pharynx.

Palatopharyngeus fibers descends from the sides of palate and run longitudinally on the inner part of constrictors.

Nerve Supply: All muscle supplied by pharyngeal plexes except palatopharyngeus which is supplied by glossopharyngeal nerve.

MUSCLES OF LARYNX

Intrinsic muscles are as follows:

1. Cricothyroid

Origin: Lower border and lateral surface of the cricoids cartilage.

Insertion: Into the inferior cornua and lower border of the thyroid cartilage.

Action: Tensor of vocal cords.

Nerve Supply: External laryngeal nerve.

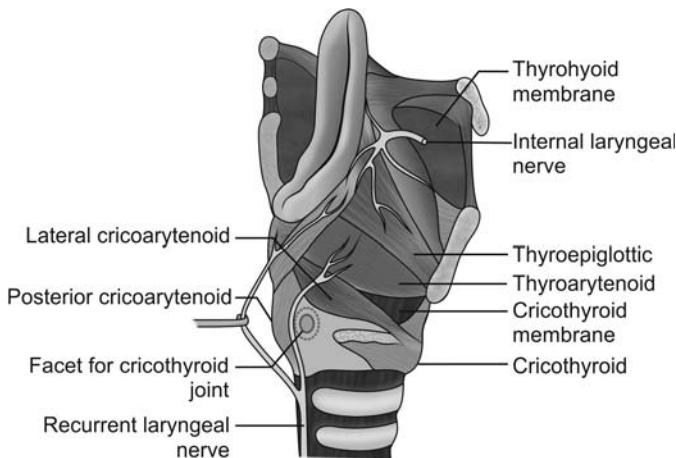


Fig. 3.20: Muscles of larynx

2. Posterior or cricoarytenoid

This is a triangular muscle

Origin: Posterior surface of the lamina of the cricoids cartilage.

Insertion: Into posterior aspect of muscular process of the arytenoids cartilage.

Action: Abductor (lateral of vocal cord).

Nerve supply: Recurrent laryngeal nerve.

3. **Lateral cricoarytenoid**

Origin: Lateral part of the upper border of the arch of the cricoids cartilage.

Insertion: Inserted into the anterior aspect of muscular process of the arytenoids cartilage.

Action: Abductor of vocal cords.

Nerve Supply: Recurrent laryngeal nerve.

4. **Transverse arytenoids**

This is only unpaired intrinsic muscle of the larynx.

Insertion: Its fibers runs transversely from the posterior surface of one arytenoid cartilage of that of the opposite arytenoids cartilage.

Action: Medial movement (Adductor) of vocal cords.

Nerve supply: Recurrent laryngeal nerve cord.

5. **Oblique arytenoid**

These are slips of muscle that run obliquely across the midline crossing each other.

Origin: Each slip arises from the muscular process of one arytenoid cartilage.

Insertion: Inserted into apex of the opposite arytenoids cartilage.

Action: Medial movement (Adductor) of vocal cords.

Nerve supply: Recurrent laryngeal nerve.

6. **Aryepiglotticus:** This is made up of some fibers of the oblique arytenoids.

Which are continued into aryepiglottic fold to react the edge of the epiglottic cartilage.

Action: Closing inlet of the larynx.

Nerve supply: Recurrent laryngeal nerve.

7. **Thyroarytenoid**

Origin: From the posterior aspect of the angle of the thyroid cartilage and the adjacent part of the cricothyroid ligament.

Insertion: The fibers runs backwards and upwards to reach the anteriorolateral surface of the arytenoids cartilage.

Action: Retraction of vocal cords.

Nerve supply: Recurrent laryngeal nerve.

MUSCLES OF EAR

(Situated around the ear)

1. Auricularis anterior
2. Auricularis superior
3. Auricularis posterior

Muscles of Middle Ear

- A. Tensor tympani
- B. Stapedius

Tensor Tympani

Origin: The tensor tympani lies in a bony canal. The muscle arises from the walls of the canal in which it lies. Some fibers arise from the cartilaginous part of the auditory tube. Some arise from base of the stall.

Insertion: The muscle ends in a tendon which reaches the medial wall of the middle ear.

Nerve supply: Supplied by the mandibular nerve.

Stapedius Muscle

Lies in a bony canal that is related to the posterior wall of the middle ear. The muscles arises from the walls of the canal.

Nerve supply: Supplied by facial nerve. It is inserted into posterior surface of neck of the stapes.

MUSCLES OF NECK

1. Sternocleidomastoid
2. Trapezius
3. Latissimus dorsi
4. Platysma

SCM – Sternocleidomastoid Muscle

The SCM is large superficial muscle of the neck supplied by spinal root of the accessory nerve.

Origin:

- a. The sternal head is tendinous and arises from the superolateral part of the manubrium sterni.
- b. The clavicular head is musculotendinous and arises from the medial one-third of the superior surface of the clavicle. It passes deep to the sternal head and the two heads blend below the middle of the neck.

Insertion: It is inserted

- a. By a thick tendon into the lateral surface of the mastoid process
- b. By a thin aponeurosis into the lateral half of the superior vertical line of the occipital bone.

Nerve supply:

- I. The spinal accessory nerve provides the motor supply. It passes through the muscle.
- II. Branches from the ventral rami of C2 are proprioceptive.

Blood Supply–Arterial Supply

- I. One branch catches from superior thyroid artery
- II. Supra scapular artery
- III. Two branches from the occipital artery.

Venous supply: veins follow the arteries

Action:

A. When one muscle contracts:

- a. It turns the chin to the opposite side
- b. It can also tilt the head towards the shoulder.

B. When both muscles contracts together:

- a. They draw the head forwards as in eating and in lifting a head from a pillow.
- b. With the longus colli; they flex the neck against resistance.
- c. The reverse action helps in forced inspiration.

Trapezius

Two, together cover the upper half of the back.

Origin:

- I. Medial one-third superior line
- II. External occipital protuberance
- III. Ligamentum nuchae
- IV. C1 spine
- V. T1-T2 Spines
- VI. Corresponding superaspinous ligament

Insertion:

- I. Upper fibers into the posterior border of lateral one-third of clavicle
- II. Middle fibers into the medial margin of the acromion and upper lip of the crest of spine of the scapula
- III. Lower fiber on the tubercle at the medial end of the spine with a bursa intervening.

Nerve supply:

- I. Spinal part of accessory nerve is motor
- II. Branches from C3-C4 are proprioceptive.

Action:

- I. Upper act with levator scapulae and elevate the scapula: struggling.
- II. Middle fiber act with rhomboid and retract the scapula forward round the chest wall—abduction should beyond 90 degree.
- III. Steadies the scapula.

Latissimus Dorsi

Covers large area of the lower back is overlapped by the trapezius.

Origin:

- I. Posterior one-third of the outer lip of iliac crest
- II. Posterior layer of lumbar fascia attaching the muscles to the lumbar and sacral spines
- III. Spine of T7-T12
- IV. Lower four ribs
- V. Inferior angle of scapula.

Insertion:

- I. The muscle wind round the lower border of terus major and forms the posterior fold of axilla.
- II. The tendon is twisted upside down inserted into one inch of the floor of bicipital groove nerve to latissimus dorsi (thoracodorsal) C6 to C8.

Action:

- I. Adduction, extension and medial rotation of shoulder—swimming, rowing, climbing, pulling, folding the arm, behind the back, scratching the opposite scapula.
- II. Helps in violent expression—coughing and sneezing essentially a climbing muscle. Hold inferior angle of scapula.

MUSCLES OF BACK OF THE NECK

The muscles of the entire back can be grouped into the following four layers from superficial to the deeper plane:

- A. (1) Trapezius (2) Latissimus dorsi
- B. (1) Levator scapulae, (2) Rhomboideus (two), (3) Serratus posterior superior, (4) Serratus posterior inferior, (5) Splenius.
- C. 1. Erector spinae or sacrospinalis spilts into three columns:

- I. Iliocostalis
- II. Longissimus
- III. Spinalis
- 2. Semispinalis—it has three parts:
 - a. Semispinalis
 - b. Semispinalis cervicis
 - c. Semispinalis capitis
- D. (1) Multifidus, (2) Rotators, (3) Inspinalis, (4) Intertransversarii, (5) Suboccipital muscle.

Chapter

4

Classification **(Diseases/Disorders/Conditions/ Materials and Methods)**

Chapter Outline

- Suture Materials
- Sterilization
- Medically Compromised Conditions
- Hemorrhage
- Hemophilia
- Syncope
- Shock
- Local Anesthetic Agents
- Classification of LA Complications
- General Anesthetic Agents
- GA Complications
- Dental Elevators
- Impacted Mandibular Third Molar
- Impacted Maxillary Third Molar
- Impacted Maxillary Canine
- Trismus
- Fascial Spaces
- Osteomyelitis
- Cyst of Jaw and Oral Cavity
- Tumors of Jaw and Oral Cavity
- Salivary Glands
- Salivary Gland Diseases or Disorders
- Salivary Gland Tumors
- Disease of Maxillary Sinus
- Precancerous Lesion
- Oral Submucous Fibrosis
- Preprosthetic Surgical Procedure

Contd...

Contd...

- Vestibuloplasty
- Alveoloplasty
- Fibro-osseous Lesions
- Giant Cell Lesion
- Temporomandibular Joint Disorder
- Temporomandibular Joint Ankylosis (Hypomobility)
- Temporomandibular Joint Hypermobility
- Orofacial Pain
- Nerve Injuries
- Facial Paralysis
- Fracture of Mandible
- Middle Third Facial Skeleton
- Zygomatic Complex Fracture
- Orbital Fracture
- Nasoethmoid Orbital Fracture
- Tracheostomy
- TNM Staging
- Neck Dissection
- Cleft Palate and Cleft Lip
- Dental Implant
- Classification of Jaw Deformities

SUTURE MATERIALS

Classify into two groups:

- A. Absorbable suture material
- B. Non-absorbable suture material
 - A. Absorbable suture material
 1. Catgut (a) plain catgut (b) chromic catgut
 2. Collagen
 3. Polyglycolic acid
 4. Polyglactin 910
 - B. Non-absorbable suture material
 1. Silk
 2. Nylon
 3. Cotton
 4. Linen
 5. Metal

6. Dacron polyester
7. Polypropylene
8. Polyethylene
9. Teflon coated dacron polyester
10. Silicon coated dacron polyester
11. Stainless steel
12. Tantalum.

STERILIZATION

Classified as: (A) Physical method, (B) Chemical method

Physical Method

1. Heat sterilization:
 - A. Moist heat sterilization: (I) Pressure steam sterilization (II) Boiling water (III) Oil
 - B. Dry heat sterilization
2. Gas sterilization: ethylene oxide gas.
3. Irradiation:
 - I. Ionization radiation, e.g. X-rays, gamma rays, high speed electrons.
 - II. Non-ionizing radiation—ultraviolet light.

Chemical Method

1. Chemical vapor sterilization—formaldehyde, alcohol and water.
2. Cold or chemical sterilization (chemical disinfection)
 - I. Cidex activated glutaraldehyde 2 percent
 - II. Phenolic solutions
 - III. Aqueous “quat” solution (quaternary ammonium compound).
 - IV. Ethyl alcohol (70 to 95%)
 - V. Iodine and iodophors
 - VI. Formaldehyde 8 percent
 - VII. Formaline 20 percent

MEDICALLY COMPROMISED CONDITION**A. WHO classification on basis of organ/system/condition**

1. Cardiovascular system:
 - I. Rheumatic fever
 - II. Artificial heart valve
 - III. Coronary heart disease
 - IV. Angina pectoris
 - V. Acute myocardial infarction
2. Respiratory system:
 - I. Bronchial asthma
 - II. Pulmonary tuberculosis
 - III. Chronic obstructive pulmonary disease (COPD)
3. Hematological disorders:
 - I. Hemophilia
 - II. Leukemia
 - III. Sickle cell anemia
 - IV. Warfarin therapy
4. Infectious disease:
 - I. Infective endocarditis
 - II. Infectious mononucleosis
5. Endocrine system:
 - I. Diabetes mellitus
 - II. Hyperthyroidism
 - III. Adrenal insufficiency
 - IV. Secondary parathyroidism
6. Obstetric condition: Pregnancy
7. Liver disorders: Hepatitis
8. Renal conditions:
 - I. Hemodialysis
 - II. Renal failure and transplantation
9. Neoplastic conditions: Cancer
10. Viral immunological conditions: AIDS
11. Musculoskeletal condition:
 - I. Joint replacement
 - II. Prosthetic implant

12. Allergic disorders:
 - I. Natural rubber latex allergy
 - II. Air allergy
13. Neurological disorders:
 - I. Epilepsy
 - II. Stroke
 - III. Psychological problem
 - IV. Behavioral disorders
14. Other conditions:
 - I. Recent weight change.

ASA Classification “American Society of Anesthetologists”

Six medical risks categories with examples:

ASA I

- A. A normal healthy patient without systemic disease
- B. (2 + 2): no breath shortness

ASA II

- A. Mild systemic disease
- B. (1 + 2)- may have breath shortness after completion
- C. Examples: Adult onset diabetes, uncontrolled asthma, epilepsy, hyperthermia, allergy, pregnancy, upper RTI, obesity.

ASA III

- A. A severe systemic disease that limits the activity, but not incapacitating.
- B. (1 + 2)- may stop on route because of shortness of breath or distress.
- C. Examples: Stable angina, post MI (>6 months) without signs and symptoms, well controlled IDDM, CCF, COPD, exercise induced asthma, BP >160/96 mm of hg.

ASA IV

- A. An incapacitating systemic disease constantly threatening life
- B. (1 + 1) breaths shortness or distress at rest.
- C. Examples: heart attack within 6 months, unstable angina, BP > 200/115 mm of hg, CCF, COPD on O₂ supplementation. Uncontrolled diabetes or epilepsy.

ASA V

A moribund patient who is not expecting to survive 24 hrs with or without intervention.

ASA E

- A. Emergency procedure of any kind “E” precedes the ASA no. indicating patients physical status.

HEMORRHAGE**Classified as:**

- A. Arterial hemorrhage:
 - will be bright red color
 - distinguished by its pulsating character
 - vigor of flow
- B. Venous hemorrhage:
 - will be darker red in color
 - may not have the pulsating quality
 - the flow will be less rapid
- C. Capillary hemorrhage:
 - an intermediate in color—a color between bright red and darker red in color
 - non pulsating in character
 - capillary blood will be oozing
 - may be quite aggressive in oral and maxillofacial region as a result of strong arterial pulse on one side of capillaries.

HEMOPHILIA

Classified as:

- A. Hemophilia A (True hemophilia)
Deficient factor VII – Antihemophilic globulin.
- B. Hemophilia B (Christmas disease)
Deficient factor IV–Plasma thromboplastin components.
- C. Hemophilia C
Deficient factor XI–Plasma thromboplastin antecedent.

SYNCOPE

Classified into three broad groups depending upon their cause.

- A. Episodes occurring secondary to a decrease in the quantity of blood reaching to brain.
- B. Episodes arising from a change in quality of blood to the brain.
- C. Episodes that occur secondary to disturbance within brain structure.

SHOCK

- A. Classified on clinical basis
 - I. Hypovolemic shock (oligemic shock)
 - II. Cardiogenic shock
 - III. Obstructive shock
 - IV. Distributive shock
- B. Classify on basis of “pathophysiology mechanism”
 - I. Non-progressive shock
 - II. Progressive shock
 - III. Irreversible shock.

LOCAL ANESTHETIC AGENTS

1st Classification

- A. Natural-cocaine
- B. Synthetic nitrogenous compounds
 - I. Amino esters of PABA (Para amino benzoic acid)-procaine
 - II. Alkyl esters of PABA-Benzocaine
 - III. Amino esters of MABA (Meta amino benzoic acid)-unacaine.
 - IV. Amino amides—xylocaine and bupivacaine.
- C. Synthetic non nitrogenous compounds—benzyl alcohol.
- D. Miscellaneous drugs—clove oil, phenol.

2nd Classification-On basis of pharmacology

- A. Esters:
 - a. Esters of benzoic acid:
 - I. Butacaine
 - II. Benzocaine
 - III. Cocaine
 - IV. Tetracaine
 - V. Hexylcaine
 - VI. Piperocaine
 - b. Esters of paraamino benzoic acid:
 - I. Procaine
 - II. Chlorprocaine
- B. Amides:
 - I. Lidocaine/xylocaine/lignocaine
 - II. Etidocaine
 - III. Mepivacaine
 - IV. Bupivacaine

CLASSIFICATION OF LA COMPLICATIONS

Complication can be classified as:

1. Local complication of LA agent
2. Systemic complication of LA agent

1. Local complication of LA agent

Can be classified in main three categories:

- A. Complications arising from drugs/chemicals used for LA.
 - i. soft tissue injury
 - ii. sloughing of tissue 'tissue ischchemia', tissue necrosis.
- B. Complication arising from injection technique
 - i. needle stick injuries
 - ii. needle breakage
 - iii. hemotoma
 - iv. failure to obtain LA.
- C. Complication arising from both
 - i. Pain on injection
 - ii. Burning on injection
 - iii. Infection
 - iv. Trismus
 - v. Edema
 - vi. Mucosal blanching
 - vii. Persistent parasthesia
 - viii. Persistent or prolonged pain
 - ix. Post injection herpetic lesion, intra-oral lesion-apthous ulcer
 - x. Bizarre neurological complications—facial nerve paralysis, visual disturbances, e.g. diplopia, temporary blindness, permanent blindness.

Other classification of local complications of LA agent: perioperative local complication are as follows:

- Needle breakage
- Pain on injection

- Burning on injection
- Persistent anesthesia (paresthesia)
- Trismus
- Hematoma
- Infection
- Edema
- Sloughing of tissue
- Soft tissue trauma (lip, cheek, tongue)
- Facial nerve paralysis
- Postoperative intraoral lesion
 - Recurrent aphthous ulcer
 - Herpes simplex
- Visual disturbance
- Intravascular injection
- Failure to obtain anesthesia.

2. Systemic complication of LA agent

- A. Overdose reaction (toxicity)
- B. Allergy (anaphylaxis reaction)
- C. Idiosyncrasy
- D. Syncope
- E. Drug interaction
- F. Serum hepatitis
- G. Occupational dermatitis
- H. Hyperventilation
 - I. Respiratory arrest
 - J. Cardiac arrest.

GENERAL ANESTHETIC AGENTS

Classification:

- A. Inhalation general anesthetics:**
- a. Volatile liquids

- I. Chloroform
 - II. Diethyl ether
 - III. Ethyl chloride
 - IV. Trichloroethylene
 - V. Halothane
 - VI. Enflurane
- b. Gases
 - I. Cyclopane
 - II. Nitrous oxide
- B. Nonvolatile general anesthetics [Intravenous anesthetics]**
 - a. Ultra short acting barbiturates
 - I. Thiopental sodium (methohexital)
 - b. Nonbarbiturates
 - I. Eugenol derivatives "Propanidol"
 - II. Phencyclidine derivative "Ketamine"
 - III. Steroid "Althesin"
 - IV. Ethomidate.

GA COMPLICATIONS

1st Classification:

- A. Preoperative complications—related to prior drug therapy:
 - I. Prolonged apnea
 - II. Diminished cardiac reserve
 - III. Cardiac arrhythmias
 - IV. Stress induced hypertension
- B. Common complications during maintenance of GA:
 - I. Coughing due to irritation of artificial airway
 - II. Hiccup "intermittent spasm of diaphragm"
 - III. Wheezing
 - IV. Cyanosis
 - V. Cardiac arrhythmias
 - VI. Fluctuation in blood pressure

- VII. Carbon dioxide status
- VIII. Change of body temperature
- IX. Laryngospasm
- X. Life threatening upper airway obstruction
- XI. Pulmonary aspiration in anesthetized patient
- XII. Cardiac arrest during anesthesia
- Severe drug reactions.
- C. Complications due to position:
 - I. Nerve injury
 - II. Air embolism
 - III. Awareness during GA.
- D. Postoperative complications:
 - I. Nausea and vomiting
 - II. Hypertension
 - III. Respiratory inadequacy
 - IV. Failure to wake up
 - V. Postoperative infection
 - VI. Postoperative restlessness
 - VII. Respiratory obstruction
 - VIII. Postoperative shivering.

2nd Classification:

- A. Complications associated with intravenous injection:
 - I. Hematoma
 - II. Extravenous injection
 - III. Venous thrombosis
 - IV. Intra-arterial injection
- B. Complications associated with endotracheal intubation:
 - I. Trauma to teeth and soft tissue
 - II. Bleeding
 - III. Inhalation of gastric contents
 - IV. Intubation of right bronchus
 - V. Postoperative sore throat
 - VI. Postoperative muscle pain

- C. Cardiovascular complications:
 - I. Hypotension
 - II. Reflex stimuli
 - III. Cardiac arrhythmias
 - IV. Cardiac arrest
- D. Complications associated with respiratory system:
 - I. Respiratory depression
 - II. Respiratory obstruction
 - a. Laryngeal spasm
 - b. Aspiration of foreign materials into tracheobronchial tract.
- E. Neurological complication:
 - I. Delayed recovery
 - II. Convulsion
- F. Allergic response.

DENTAL ELEVATORS

Classification:

- A. According to their use:
 - I. Elevator designed to remove the entire tooth.
 - II. Elevator designed to remove root broken off at gingival line.
 - III. Elevator designed to remove root broken halfway to apex.
 - IV. Elevator designed to remove the apical third off root.
 - V. Elevator designed to reflect the mucoperiosteum.
- B. According to form:
 - I. Straight—wedge type
 - II. Angular—right and left
 - III. Crossbar—handle at right angle to shank.

IMPACTED MANDIBULAR THIRD MOLAR

1st Classification - Pell and Gregory Classification

Two groups – (A and B):

A. Relation of tooth to ramus of mandible and 2nd molar

Class I: There is sufficient amount of space between the ramus and distal side of 2nd molar for the accommodation of the mesiodistal diameter of the crown of 3rd molar.

Class II: The space between the ramus and distal side of second molar is less than mesiodistal diameter of the crown of 3rd molar.

Class III: All or most of the third molar is located within the ramus.

B. Relative depth of third molar in the bone:

Position A: The highest position of tooth is in level with or above the occlusal line.

Position B: The highest portion of tooth is below the occlusal plane but above the cervical line of second molar.

Position C: The highest position of tooth is below the cervical line of second molar.

2nd Classification - Winter Classification

On the basis of position of long axis of impacted 3rd molar in relation of long axis of 2nd molar.

- I. Vertical
- II. Horizontal
- III. Inverted
- IV. Mesioangular
- V. Distoangular
- VI. Buccoversion
- VII. Linguoversion

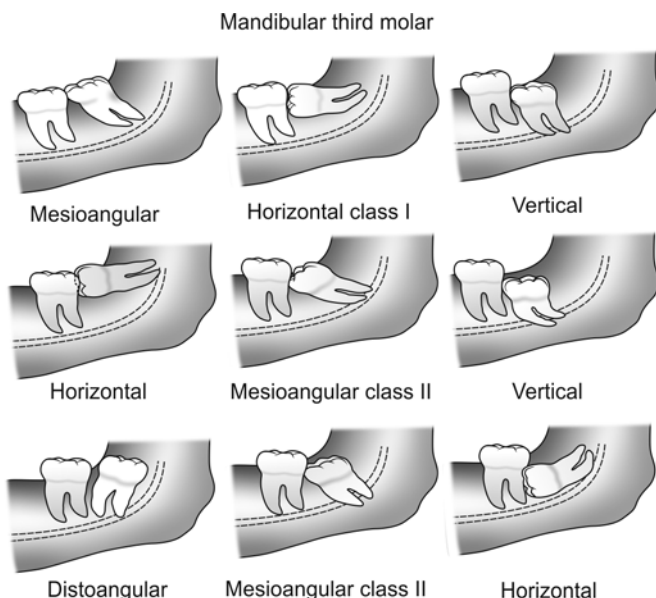


Fig. 4.1: Classification of impacted mandibular third molar

3rd Classification - Combined ADA and AAOMS

Classification:

The American association of oral and maxillofacial surgeons published the ADA American dental association coding with explanation.

Code Explanation:

07220 = soft tissue impaction

07230 = partial bony impaction

07240 = complete bony impaction

07241 = complete bony impaction with unusual surgical complication.

IMPACTED MAXILLARY THIRD MOLAR

1st Classification:

According to relative depth of impacted maxillary third molar in the bone.

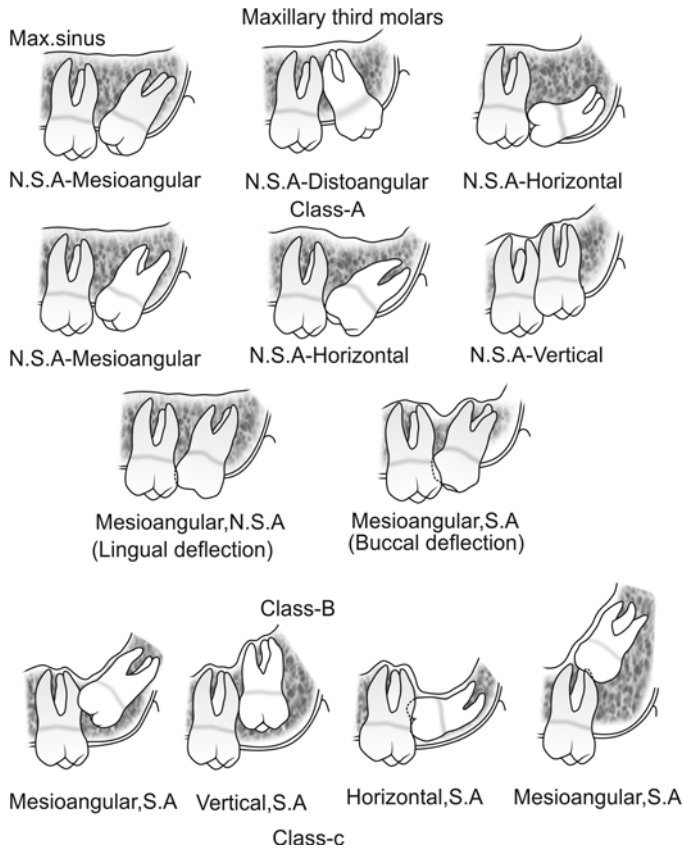


Fig. 4.2: Impacted maxillary third molar

Class A: When lowest portion of crown of impacted third molar is in line with or below the occlusal plane of second molar.

Class B: When lowest portion of crown of impacted third molar is between the occlusal plane and cervical line of second molar.

Class C: When lowest portion of crown of impacted third molar is at or above the level of cervical line of second molar.

2nd Classification:

According to position of long axis of impacted third molar in relation to 2nd molar:

- I. Vertical
- II. Horizontal
- III. Mesioangular
- IV. Distoangular
- V. Inverted (Torsoversion)
- VI. Buccoversion
- VII. Palatoversion

3rd Classification:

According to relationship of third molar to maxillary sinus:

- A. Sinus approximation position - where there is practically no bone or very thin bone present between the sinus and third molar.
- B. No sinus approximation position - when atleast 2 mm or more bone is present between the sinus and third molar.

IMPACTED MAXILLARY CANINE

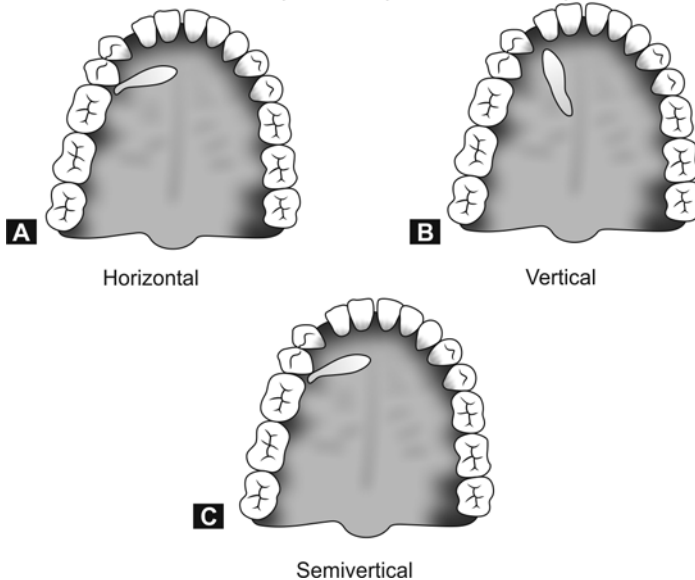
1st Classification:

Based on finding of: *Field and Ackerman 1935*

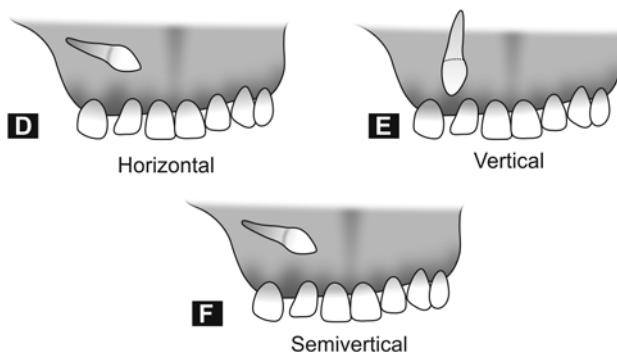
- A. Labial position
 - I. Crown in intimate relationship with incisors.
 - II. Crown well above apices of incisors.

- B. Palatal position
 - I. Crown near surface in close relationship to root of incisors.
 - II. Crown deeply embedded in close relationship to apices of incisors.
- C. Intermediate position
 - I. Crown between lateral incisors and first premolar roots.
 - II. Crown above these teeth with crown labially placed and root palatally.
 - III. Or vice versa.
- D. Unusual position
 - I. In nasal or antral wall
 - II. In infraorbital region

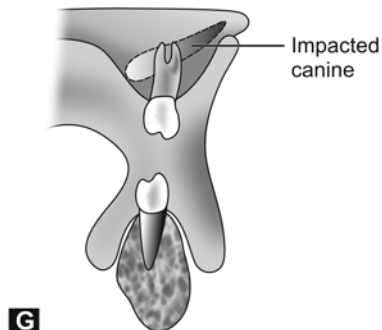
Class I : Impacted cuspids located in the palate



Class II : Impacted cuspid location in the labial surface of the maxilla



Class III: Impacted canines location in both the palatal process and labial or buccal maxillary bone, e.g, the crown is on the palate and the root passes through between the roots of the adjacent teeth in the alveolar process, ending in a sharp angle on the labial or buccal surface of the maxilla



Class IV: Impacted canines located in the alveolar process, usually vertically between incisor 1st bic uspid

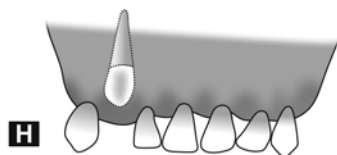


Fig. 4.3: A to H Impacted maxillary canine

2nd Classification:

Class I: Impacted cuspid located in palate, may be:

- a. Horizontal
- b. Vertical
- c. Semivertical

Class II: Impacted cuspid located in labial or buccal surface of maxilla, may be:

- a. Horizontal
- b. Vertical
- c. Semivertical

Class III: Impacted cuspid located both on palatal and labial or buccal surface.

For example, The crown is on the palate. The root passes through between the roots of adjacent teeth in the alveolar process, ending in a sharp angle on labial or buccal surface of the maxilla.

Class IV: Impacted cuspid located in the alveolar process vertically between the incisors and first bicuspid.

Class V: Impacted cuspid located in an edentulous maxilla.

TRISMUS

1. Inflammatory conditions:
 - Pericoronitis
 - Dentoalveolar abscess
 - Odontogenic infection
 - TMJ arthritis
 - TMJ dislocation
 - Acute tonsillitis
 - Parotitis
 - Otitis externa
 - Quinsy
2. Traumatic conditions:
 - Infection after 3rd molar surgery
 - Post injection sequelae

- Fracture of mandible “condyle” / Angle
 - Fracture of zygomatic arch
 - Fibrous ankylosis
 - Edema from surgical insult
 - Myositis ossification
3. Neoplastic condition
 - Submucous fibrosis
 - Carcinoma of oral cavity
 4. Neurogenic conditions
 - Tetanus (bacterial infection)
 - Tetany (hypocalcemia)
 - Hysteria.

FASCIAL SPACES

1st Classification:

- A. On the face:
 1. Canine space
 2. Buccal space
 3. Masticatory spaces
 - i. Masseteric space
 - ii. Pterygomandibular space
 - iii. Temporal space (Zygomatictemporal space)
 4. Parotid space
 5. Infratemporal space.
- B. Suprahyoid fascial space:
 1. Sublingual space
 2. Submental space
 3. Submandibular space
 4. Lateral pharyngeal space
 5. Peritonsillar space
- C. Infrahyoid space: Pretracheal space
- D. Spaces of the total neck region:
 1. Retropharyngeal space
 2. Danger space
 3. Space of the carotid sheath.

2nd Classification: Based on Mode of Involvement

- A. Direct involvement or primary spaces:
 - a. Maxillary spaces
 - i. Canine spaces
 - ii. Buccal spaces
 - iii. Infratemporal space
 - b. Mandibular spaces
 - i. Submental spaces
 - ii. Submandibular space
 - iii. Sublingual space
 - iv. Buccal space
- B. Indirect involvement or secondary spaces:
 - a. Massetric
 - b. Pterygomandibular
 - c. Superficial and deep temporal
 - d. Parotid space
 - e. Lateral pharyngeal
 - f. Retropharyngeal
 - g. Prevertebral space.

OSTEOMYELITIS**1st Classification:**

- A. Acute osteomyelitis:
 - I. Pyogenic osteomyelitis in infants and nursings.
 - II. Acute infective osteomyelitis in young children.
 - III. Acute infective osteomyelitis in adult.
- B. Chronic osteomyelitis:
 - I. Chronic suppurative osteomyelitis
 - II. Chronic sclerosing osteomyelitis
 - III. Garre's osteomyelitis
- C. Chronic osteomyelitis associated with systemic disease:
 - I. Tuberculosis of jaw
 - II. Syphilis of jaw
 - III. Actinomycosis of jaw

- D. Necrosis of jaw due to:
 - I. Chemicals
 - II. Electrocoagulation
 - III. Radiation
- E. Dry socket/focal osteomyelitis/dry osteomyelitis.

2nd classification:

Based on clinical course:

- A. Acute form of osteomyelitis (suppurative and non-suppurative)
 - 1. Contiguous focus
 - I. Trauma
 - II. Surgery
 - III. Odontogenic infections
 - 2. Progressive
 - I. Burns
 - II. Sinusitis
 - III. Vascular insufficiency
 - 3. Hemotogenous (metastatic): Developing children
- B. Chronic forms of osteomyelitis:
 - 1. Recurrent multifocal
 - I. Developing children
 - II. Escalated osteogenic activity
 - 2. Garre's
 - I. Unique proliferative subperiosteal reaction
 - II. Developing skeleton
 - 3. Suppurative or nonsuppurative
 - I. Inadequately treated forms
 - II. Systemically compromised forms
 - III. Refractory forms chronic refractory osteomyelitis
 - 4. Diffuse sclerosing
 - I. Fastidious organisms
 - II. Compromised host/pathogen interface

3rd Classification:

Classification on basis of pathogenesis of alter vascular perfusion; main three types.

1. Hematogenous OML.
2. OML secondary to contiguous focus of infection.
3. OML associated with or without peripheral vascular disease.

4th Classification:

Classification based on presence or absence of suppuration.

- A. Suppurative osteomyelitis:
 - I. Acute suppurative (pyogenic) OML
 - II. Chronic suppurative OML
 - a. Primary
 - b. Secondary
 - III. Infantile OML
- B. Nonsuppurative osteomyelitis:
 - I. Chronic sclerosing OML
 - a. Focal sclerosing OML
 - b. Diffuse sclerosing OML
 - II. Garre's sclerosing OML
 - III. Actinomycotic OML
 - IV. Radiation OML
 - V. Specific infective OML
 - a. Tuberculosis
 - b. Syphilis.

5th Classification:

Gierary and Vibhagool (1993); developed a classification and staging systems.

- A. Anatomic types:

Stage I: Medullary OML—it involves medullary bone without cortical involvement usually hematogenous.

Stage II: Superficial OML—less than 2 cms of bony defect without cancellous bone.

Stage III: Localized OML—less than 2 cms of bony defect seen on radiographs defect does not appear to involve both cortices.

Stage IV: Diffuse OML—less than 2 cms of bony defect, pathological fracture, infection and union.

- B. Physiological types:
 - I. Host- normal host
 - II. Host- (I) Systemic compromise (II) Local compromise
 - III. Host- Treatment is worse than the disease
- C. Systemic or local factors.

Systemic

- I. Malnutrition
- II. Renal or hepatic failure
- III. Diabetic mellitus
- IV. Chronic hypoxia
- V. Immune deficiency or suppression
- VI. Malignancy
- VII. Extremes of age
- VIII. Autoimmune disease
- IX. Tobacco and alcohol abuse.

Local

- I. Chronic lymphoedema
- II. Venous stasis
- III. Major vessel disease
- IV. Arteritis
- V. Extensive scarring
- VI. Radiation fibrosis
- VII. Small vessel disease
- VIII. Loss of local sensation.

CYST OF JAW AND ORAL CAVITY**1st Classification: WHO Classification "Shear-1983"**

1. Epithelial cyst
 - A. Odontogenic cyst
 - a. Developmental cyst:
 - i. Gingival cyst of infants
 - ii. Gingival cyst of adults
 - iii. Lateral periodontal cyst
 - iv. Dentigerous cyst (Follicular cyst)
 - v. Odontogenic keratocyst (Nevoid basal cell carcinoma syndrome)
 - vi. Calcifying odontogenic cyst (Gorlin cyst)
 - vii. Eruption cyst
 - b. Inflammatory cyst:
 - i. Radicular cyst
 - ii. Residual cyst
 - iii. Inflammatory lateral periodontal cyst
 - iv. Paradental cyst
 - B. Nonodontogenic cyst
 - a. Fissural cyst:
 - i. Nasopalatine duct cyst (Incisive canal cyst)
 - ii. Median palatine cyst
 - iii. Median mandibular cyst
 - iv. Nasolabial cyst (Naso alveolar cyst)
 - v. Globulomaxillary cyst
 - b. Retention cyst:
 - i. Mucocele
 - ii. Ranula
2. Nonepithelial cyst
 - i. Aneurysm Bone Cyst (ABC)
 - ii. Traumatic Bone Cyst
 - Simple
 - Solitary
 - Hemorrhagic bone cyst.

2nd Classification:

1. Intraosseous cyst:
 - A. Odontogenic
 - a. Periodontal
 - i. Inflammatory
 - Apical periodontal
 - Residual
 - ii. Developmental
 - Lateral periodontal
 - b. Follicular (Dentigerous)
 - c. Primordial
 - d. Odontogenic keratocyst
 - Parakeratinized variant
 - Orthokeratinized variant
 - e. Calcifying odontogenic (Gorlin cyst)
 - B. Nonodontogenic
 - a. developmental
 - i. fissural
 - median mandibular
 - median palatal
 - globulomaxillary
 - ii. incisive canal (nasopalatine duct)
 - C. Nonepithelial bone cyst "cyst like condition"
 - i. Traumatic bone cyst (solitary bone cyst)
 - ii. Aneurysmal bone cyst
 - iii. Stafne's bone cavity (mandibular salivary gland)
2. Soft tissue cyst:
 - i. Salivary gland
 - ii. Gingival
 - iii. Dermoid
 - iv. Thyroglossal
 - v. Nasolabial
 - vi. Lymphoepithelial
 - a. Cervical (branchial cleft)
 - b. Intraoral.

3rd Classification - Robinson's Classification (1945)*Developmental cysts*

- A. From odontogenic tissue:
 - 1. Periodontal cyst:
 - a. Radicular or dental root apex type
 - b. Lateral type
 - c. Residual type
 - 2. Dentigerous cyst
 - 3. Primordial cyst
- B. From non-dental tissues:
 - 1. Median cyst (median palatine cyst)
 - 2. Incisive canal cyst
 - 3. Globulomaxillary cyst.

4th Classification-Thoma-Robinson-Bernier Classification (1960)*Odontogenic ectodermal epithelial cysts*

- A. Follicular cysts:
 - 1. Primordial cysts
 - 2. Dentigerous cysts
 - i. Lateral
 - ii. Central
- B. Periodontal cysts:
 - i. Apical
 - ii. Lateral
- C. Residual cysts:
 - 1. Follicular
 - 2. Periodontal
- D. Multiple cysts
- E. Multilocular cysts
- F. Polycystoma cysts
- G. Cholesteatoma

Nonodontogenic ectodermal epithelial cysts

- A. Interosseous cysts
 - 1. Median

2. Intermaxillary
3. Nasoalveolar
- B. Nasopalatine cysts
 1. Incisive canal cysts
 2. Cyst of papilla palatine.

5th Classification -Kruger's Classification (1964)

- A. Congenital cysts
 1. Thyroglossal
 2. Branchiogenic
 3. Dermoid
- B. Developmental cysts
 1. Non-dental origin
 - a. Fissural types
 - i. Nasoalveolar
 - ii. Median
 - iii. Incisive canal
 - iv. Globulomaxillary
 - b. Retention types
 - i. Mucocele
 - ii. Ranula
 2. Dental origin
 - a. Periodontal
 - i. Periapical
 - ii. Lateral
 - iii. Residual
 - b. Primordial
 - c. Dentigerous.

6th Classification -Seward's Classification (1964)

Cysts with an epithelial lining

- A. From nonodontogenic epithelium
 1. Maxillary
 - a. Nasopalatine
 - i. Incisive canal cyst
 - ii. Incisive papilla cyst

- b. Globulomaxillary cyst
 - c. Median palatine cyst
 - d. Nasolabial cyst
 - 2. Mandibular
 - Median mandibular cyst
- B. From odontogenic epithelium
 - 1. Associated with the crown of the tooth
 - a. Cyst of eruption
 - b. Dentigerous cyst
 - i. Pericoronal
 - ii. Lateral
 - iii. Residual
 - c. Extrafollicular dentigerous cyst
 - 2. Associated with the root of the tooth
 - a. Inflammatory periodontal or radicular cyst
 - i. Apical
 - ii. Lateral
 - iii. Residual
 - b. Developmental periodontal cyst
 - c. Extrafollicular dentigerous cyst
 - 3. Unassociated with a tooth
 - a. Primordial
 - b. Rare entities
 - i. Cyst of interdental papilla
 - ii. Some gingival cysts
 - 4. Cystic neoplasms (may occur both solid & cystic form)
 - a. Ameloblastoma
 - b. Adeno-ameloblastoma
 - c. Ameloblastic odontoma

Cysts without an epithelial lining

- A. Bone cysts
- B. Stromal cysts in neoplasms.

7th Classification - Lucas's Classification (1964)*Intraosseous cysts*

- A. Fissural cysts
 - 1. Median mandibular
 - 2. Median palatal
 - 3. Nasopalatine
 - 4. Globulomaxillary
 - 5. Nasolabial
- B. Odontogenic cysts
 - 1. Developmental
 - a. Primordial
 - b. Dentigerous
 - 2. Inflammatory
 - 3. Radicular
- C. Nonepithelial bone cysts
 - 1. Solitary bone cyst
 - 2. Aneurysmal bone cyst.

8th Classification - Gorlin's Classification (1970)*Odontogenic cysts*

- 1. Dentigerous cyst
- 2. Eruption cyst
- 3. Gingival cyst of newborn infants
- 4. Lateral periodontal and gingival cysts
- 5. Keratinizing and calcifying odontogenic cyst (cystic keratinizing tumor)
- 6. Radicular (periapical) cyst
- 7. Odontogenic keratocysts
 - a. Primordial cyst
 - b. Multiple keratocyst of jaws, multiple cutaneous nevoid basal cell carcinoma and skeletal anomalies

Nonodontogenic and fissural cysts

- 1. Globulomaxillary (premaxilla-maxillary) cyst
- 2. Nasoalveolar (nasolabial; Klestadt's) cyst

3. Nasopalatine (median anterior maxillary) cyst
4. Median mandibular cyst
5. Anterior lingual cyst
6. Dermoid and epidermoid cysts
7. Palatal cyst of newborn infants

Cysts of neck, oral floor and salivary glands

1. Thyroglossal duct cyst
2. Lymphoepithelial (branchial cleft) cyst
3. Oral cysts with gastric or intestinal epithelium
4. Salivary gland cyst
5. Mucocele and ranula

Pseudocysts of jaws

1. Aneurysmal bone cyst
2. Static (developmental; latent) bone cyst
3. Traumatic (hemorrhagic; solitary) bone cyst.

9th Classification - Main's Classification (1970)

Primordial cyst

- Replacement
- Envelopmental
- Extraneous
- Collateral

Nonodontogenic

- Median palatal
- Interjacent (Globulomaxillary)
- Nasopalatine

Dental

- Coronal
- Subfollicular
- Inflammatory
- Radicular
- Residual
- Inflammatory collateral.

TUMORS OF JAW AND ORAL CAVITY

1st Classification:

Pindborg's Classification

Classified into 3 groups:

- A. Odontogenic
- B. Nonodontogenic
- C. Tumor like lesions

A. Odontogenic tumors

- a. Benign ectodermal tumors
 - I. Ameloblastoma
 - II. Adenoid odontogenic tumors
 - III. Calcifying epithelial odontogenic tumors
- b. Benign mesodermal tumor
 - I. Odontogenic myxoma
 - II. Odontogenic fibroma
 - III. Cementoma
- c. Benign tumor having ectodermal and mesodermal elements (mixed tumor)
 - I. Ameloblastic fibroma
 - II. Ameloblastic fibroodontoma
 - III. Odontoameloblastoma
- d. Odontoma
 - I. Complex composite odontoma
 - II. Compound composite
- e. Melanotic neuroectodermal tumor of infancy.

B. Nonodontogenic tumors

- 1. Bone forming
 - I. Osteoma
 - II. Osteiod osteoma
 - III. Osteoid blastoma
 - IV. Ossifying fibroma
- 2. Cartilage forming
 - I. Chondroma
 - II. Ossifying chondroma

3. Giant cell tumors
 - I. Osteoclastoma
 - II. Reparable granuloma
 - III. Eosinophilic granuloma
 - IV. Focal lesion of hyperparathyroidism
4. Vascular tumors
 - I. Hemangioma
 - II. Hemangioendothelioma
5. Unclassified tumors
 - I. Epithelial tumor
 - II. Connective tissue tumors
 - III. Neural tumors
6. Non-neoplastic tumors.

2nd Classification:

General Classification

- A. Odontogenic tumors
 1. Epithelial tumors
 - a. Benign odontogenic epithelial tumors
 - Tumors producing minimal inductive changes in the connective tissue
 1. Ameloblastoma
 2. Calcifying odontogenic tumor
 3. Adenoameloblastoma
 - Tumor producing extensive inductive changes in the connective tissue
 1. Ameloblastic fibroma
 2. Ameloblastic fibro-odontoma
 3. Odontoameloblastoma
 4. Compound composite odontoma
 5. Complex composite odontoma
 - a. Malignant odontogenic epithelium
 1. Primary intra-alveolar epidermoid carcinoma
 2. Malignant ameloblastoma
 3. Ameloblastic carcinoma

2. Mesodermal tumors
 - a. Benign odontogenic mesodermal tumor
 1. Central odontogenic fibroma
 2. Odontogenic myxoma
 3. Cementoma
 4. Dentinoma
 - b. Malignant odontogenic mesodermal tumor
 1. Odontogenic fibrosarcoma
3. Tumors of unknown origin

Malignant neuroectodermal tumor of infancy
- B. Nonodontogenic tumors
 1. Benign
 - I. Papilloma (squamous cell)
 - II. Chondroma
 - III. Adenoma
 - IV. Myxoma
 - V. Lipoma
 - VI. Osteoma
 - VII. Fibroma
 - VIII. Benign osteoblastoma
 - IX. Leiomyoma
 - X. Rhabdomyoma
 - XI. Lymphoangioma
 - XII. Hemangioma
 - XIII. Neurofibroma
 - XIV. Neurilemmoma
 - XV. Pleomorphic adenoma
 2. Malignant nonodontogenic tumor
 - I. Squamous cell carcinoma
 - II. Malignant melanoma
 - III. Adenocarcinoma
 - IV. Basal cell carcinoma
 - V. Liposarcoma
 - VI. Fibrosarcoma
 - VII. Chondrosarcoma

- VIII. Myxosarcoma
- IX. Osteosarcoma
 - X. Malignant Osteoblastoma
- XI. Leiomyosarcoma
- XII. Rhabdomyosarcoma
- XIII. Lymphohemangioma
- XIV. Angiosarcoma
- XV. Leukaemias
- XVI. Multiple myeloma
- XVII. Malignant lymphomas
- XVIII. Neurogenic sarcoma
 - XIX. Malignant lpleomorphic adenoma
 - XX. Ewing's Sarcoma
- C. Tumor-like lesions
 - 1. Torus—torus palatinus, torus mandibularis
 - 2. Giant cell lesion—can be classified as “non odontogenic tumour”—giant cell epulis, eosinophilic granuloma, reparative granuloma, osteoclastoma.
 - 3. Teratoma
 - 4. Fibrous dysplasia
 - 5. Hematomas
 - 6. Cherubism
 - 7. Premalignant lesion—OSMF, leukoplakia, erythroplakia, carcinoma *in situ*, invasive type of lichen planus.

SALIVARY GLANDS

1st Classification: “According to Size”

- A. Major (extrinsic)—flow of saliva continuous paired three major salivary gland
 - I. Parotid gland
 - II. Submandibular gland
 - III. Sublingual gland

- B. Minor (intrinsic)—flow of saliva intermittent, e.g. buccal glands, there are 400–500 minor glands in the oral cavity (100 seen in gingival and anterior part of hard palate).

2nd Classification: “According to Location”

1. Gland whose ducts open to the “Vestibule”
 - A. Lip:
 - I. Superior labial
 - II. Inferior labial
 - B. Cheek:
 - I. Parotid
 - II. Buccal
2. Gland whose ducts open in oral cavity proper:
 - A. Floor of mouth:
 - I. Submandibular
 - II. Sublingual (major)
 - III. Sublingual (minor)
 - IV. Glossopalatine
 - B. Tongue:
 - a. Body- Anterior lingual (of Blandin and Nuhn)
 - b. Base- Posterior lingual
 - I. Von Ebner (around vallate papillae)
 - II. Tonsil, Lingual
 - C. Palate: Palatine

3rd Classification: “According to Secretion”

1. Serous:
 - a. Parotid
 - b. Von Ebner-posterior lingual near vallate papilla
2. Mucous:
 - a. Palatine
 - b. Post lingual and tonsillar
 - c. Glossopalatine

3. Mixed:
 - a. Submandibular-(predominantly serous)
 - b. Sublingual-(predominantly mucous)
 - c. Blandin-Nuhn (anterior lingual)
 - d. Labial (superior and inferior) predominantly mucous.

SALIVARY GLAND DISEASES OR DISORDERS

Classified in Six Groups

- A. Developmental:
 - I. Aplasia/agenesis
 - II. Atresia of ducts
 - III. Hypoplasia
 - IV. Congenital fistula
 - V. Aberrancy
 - VI. Accessory ducts and lobes
- B. Inflammatory sialadenitis:
 - I. Viral sialadenitis
 - II. Bacterial sialadenitis:
 - Acute sialadenitis
 - Chronic sialadenitis
 - Recurrent sialadenitis
 - III. Specific infections:
 - Syphilis
 - Tuberculosis
 - Sarcoidosis
 - Toxoplasmosis
 - IV. Allergic sialadenitis
 - V. Postirradiation sialadenitis
 - VI. Sialadenitis of minor gland
- C. Obstructive and traumatic lesions:
 - I. Sialolithiasis
 - II. Obstruction in and around ductal wall (stricture and growth)

- III. Mococele- mucous extravasation cyst:
 - Mucous retention cyst
 - Ranula
- D. Functional disorder:
 - Xerostomia (reduce salivation)
 - Ptyalism (increased salivation)
- E. Neoplastic lesion- benign, mixed and malignant tumor
- F. Autoimmune disorder-Sjögren syndrome.

SALIVARY GLAND TUMORS

WHO Classification:

- A. Epithelial tumors
 - 1. Adenomas
 - a. Pleomorphic adenomas (mixed tumors)
 - b. Monomorphic adenomas
 - 1. Adenolymphoma
 - 2. Oxyphilic adenomas
 - 3. Other types
 - 2. Mucoepidermoid tumors
 - Acini cell tumors
 - 3. Carcinomas
 - A. Adenocystic carcinoma
 - B. Adenocarcinoma
 - C. Epidermoid carcinoma (squamous cell carcinoma)
 - D. Undifferentiated
 - E. Carcinoma in pleomorphic adenoma (malignant mixed tumors)
- B. Nonepithelial tumors
- C. Unclassified tumors
- D. Allied condition
 - 1. Benign lymphoepithelial lesion
 - 2. Sialosis
 - 3. Oncocytosis.

DISEASES OF MAXILLARY SINUS

Classified as:

1. Maxillary sinusitis:
 - I. Inflammatory
 - a. Acute
 - b. Subacute
 - c. Chronic
 - II. Odontogenic
2. Oroantral fistula:
 - a. Acute
 - b. Chronic
3. Traumatic: Hematoma in sinus
4. Iatrogenic: Root or tooth displaced into the sinus
5. Tumor: Carcinoma of maxillary sinus
6. Antral sinusitis.

PRECANCEROUS LESION

Enumerated as:

1. Oral submucous fibrosis (OSMF)
2. Leukoplakia
3. Erosive lichen planus
4. Erythroplakia
5. Leukoedema
6. Syphilitic glossitis
7. Oral hairy leukoplakia

ORAL SUBMUCOUS FIBROSIS

1st Classification: "Clinical stage"

Stage 1 – Facial band only

Stage 2 – Facial and buccal

2nd Classification: Functional stage

Stage A – Mouth opening more than 20 mm

Stage B – Mouth opening 11 to 19 mm

Stage C – Mouth opening less than 10 mm

3rd Classification: “Mouth opening”

Stage 1 – Mouth opening more than 45 mm

Stage 2 – Restricted mouth opening 22–44 mm

Stage 3 – Mouth opening less than 20 mm

4th Classification of the disease clinically into two phases:

- A. Eruptive phase- characterized by erythema, vesicles, ulceration and burning sensation in mouth.
- B. Inductive phase- characterized by the disappearance of the vesicles and healing of the ulcers by fibrosis. The burning sensation decrease and blanching, stiffness of oral and oropharyngeal mucosa occurs.

5th Classification:

- A. Early OSMF – Burning sensation Blister on palate ulceration. Excessive salivation.
- B. Advance OSMF – oral mucosa become blanched, opaque white fibrous bands appear, e.g. buccal mucosa, lips, palate faucial pillars are involved.

6th Classification: Pindborg classification three stage based on histological classification -

Stage I – stomatitis include erythematous mucosa, vesicles, mucosal ulcer, melanotic mucosal pigmentation and mucosal petechia.

Stage II – fibrosis occurs in rupture vesicles, ulcer when they heal which is hallmark of this stage.

7th Classification: On the basis of clinical grading of severity:

1. Grade I – Incipient – Very early stage
2. Grade II – Mild – Early stage
3. Grade III – Moderate – Moderately advanced stage
4. Grade IV – Severe – Advanced stage

8th Classification: (Khanna and Andrade 1995) (surgical classification)

Group 1 – Earliest stage: mouth opening limitation. Opening more than 35 mm.

Group II – Mouth opening 26 to 35 mm.

Group III – Mouth opening 15 to 26 mm, fibrotic bands are seen.

Group IV A – Trismus severe, mouth opening less than 15 mm, extensive fibrosis.

Group IV B – Disease is more advanced with premalignant and malignant changes.

PREPROSTHETIC SURGICAL PROCEDURE

Divided into 4 main groups:

1. Augmentation
 - A. ON- LAY
 - I. Free submucosalgraft
 - II. Antigenic bone
 - III. Allogeneic bone
 - IV. Alloplasts
 - V. Any combination of above
 - B. Interpositional
 - I. Antogenic bone
 - II. Allogenic bone
 - III. Alloplasts
 - Tricalcium phosphate
 - Nonrestorable hydroxyapatite
 - IV. Any combination of above
2. Vestibuloplasty
 - A. With soft tissue graft
 - B. With pedicled mucosa graft
 - I. Submucosa vestibuloplastiz
 - II. Crestally pedicled mucosal grafting

- C. Secondary Epithelialization
- D. Mouth floor lowering with mylohyoid and portion of genio glossus muscle repositioning
- E. Mylohyoid repositioning
- F. Creation of postturburoosity notch
- G. Any combination of above procedure
- 3. Implants
 - A. Osseointegrated implant (screw basket blade)
 - B. Ramus frame implant
 - C. Subperiosteal implant
 - D. Stapel implant
 - E. Mucosal implant
- 4. Any combination of any augmentation, vestibuloplasty and implants.

2nd Classification: Preprosthetic corrective surgical procedures

- a. Primary preparation
- b. Secondary preparation

a. Primary preparation

- 1. Preparation to correct soft tissue deformity
 - a. Labial frenectomy
 - b. Lingual frenectomy [Ankyloglossia, Tongue Tie]
 - c. Buccal frenectomy
 - d. Double lip
 - e. Scar contracture of lip and buccal mucosa
- 2. Preparation to correct soft tissue deformities
 - a. Alveoloplasty
 - b. Alveolar repositioning
 - c. Mylohyoid ridge reduction
 - d. Genial tubercle reduction
 - e. Removal of tori
 - f. Removal of exostosis
- 3. Combination of soft and hard tissue preparation.

b. Secondary preparation

“Procedure to improve the alveolar soft tissue”

Hypermobile tissue Eupulis Fissuration

Fibrous Hyperplasia of maxillary tuberosity

Fibrous Hyperplasia of mandibular retromolar pad

Hyperplastic palatal mucosa

Papillary palatal hyperplasia “Papillomatous of the palate”.

VESTIBULOPLASTY**Classification:**

- A. By extent: (a) Total (Full ridge) (b) Partial (Segment of ridge)
- B. By dissection: (a) Open (Supraperiosteal) (b) Closed (Supraperiosteal)
- C. By healings: (a) Secondary re-epithelization (b) Covering graft
- D. Modification: (a) Lowering floor of mouth (b) Buccal inlay technique
- E. By stability of result: (a) Split thickness skin graft (b) Free mucosal graft (c) Pedicled mucosal graft (d) Secondary re-epithelization.

ALVEOLOPLASTY

Various types are as follows:

- 1. Alveolar compression
- 2. Simple alveoloplasty
- 3. Labial and buccal cortical alveoloplasty
- 4. Intercortical (interseptal) alveoloplasty
- 5. Reduction of the knife-edged ridge
- 6. Reduction of mylohyoid ridge
- 7. Reduction of lingual alveolar crest
- 8. Elimination of labial mandibular undercut.

FIBRO-OSSEOUS LESIONS

1st Classification:

Of craniofacial region in order of increasing complexity and frequency of associated finding.

- A. Tumors
 1. Ossifying fibroma
 2. Cementifying fibroma
 3. Cemento-ossifying fibroma
 4. Juvenile ossifying fibroma
 5. Giant cell lesion
 6. Aneurysmal bone cyst
 - B. Dysplasias
 1. Monostotic fibrous dysplasia
 2. Polyostotic fibrous dysplasia
 3. Craniofacial fibrous dysplasia
 4. Jaffe-Lichtenstein syndrome
 5. Albright syndrome
 6. Cherubism
 7. Periapical fibrous dysplasia
 8. Peridontal ligament
 9. Florid osseous dysplasia
 - C. Secondary inflammation infection
 1. Chronic sclerosing osteomyelitis
 2. Secondary fibrous osteomyelitis
- Transitional lesion
- Traumatic bone cyst

2nd Classification:

- A. Fibrous dysplasia
 1. Polyostotic
 2. Monostotic
 3. Albright's syndrome
- B. Fibro-osseous (Cemental) lesion

Presumably arising in the peridontal ligaments

- a. Periapical cement dysplasia
 - b. Localized fibro-osseous cemental lesions
 - c. Florid cemento-osseous dysplasia (Gigantiform cementoma)
 - d. Ossifying and cementifying fibroma
- C. Fibro-osseous neoplasm of uncertain relationship to those arising in periodontal ligament
1. Cementoblastoma, osteoblastoma, osteoid osteoma.
 2. Juvenile active ossifying fibroma, ossifying fibroma, cementifying fibroma.

GIANT CELL LESION

Enumerated as:

1. Central giant cell granuloma
2. Peripheral giant cell granuloma
3. Aggressive central giant cell granuloma
4. Giant cell tumor
5. Giant cell lesion of hyperparathyroid disease “**Brown tumor**”
6. Giant cell tumors of **Pagets**
7. **Cherubism**
8. Osteoblastoma “Giant osteoid osteoma”.

TEMPOROMANDIBULAR JOINT DISORDERS

Classification mainly two groups:

- A. Extra-articular or extrinsic origin
Not related directly with the TMJ
 1. Masticatory muscle disorders
 - I. Protective muscle splitting
 - II. Masticatory muscle inflammation

2. Extrinsic trauma
 - I. May cause fracture
 - II. Traumatic arthritis
 - III. Internal disc derangement
 - IV. Myositis
 - V. Myospasm
 - VI. Contracture of alveolar muscle-TMJ disorder
- B. Intra-articular origin or intrinsic disorder
 1. Trauma
 - I. Dislocation
 - II. Subluxation
 - III. Hemarthrosis
 - IV. Intracapsular fracture/Extracapsular fracture
 2. Internal displacement
 - I. Anterior disc displacement with reduction
 - II. Anterior disc displacement without reduction
 3. Arthritis
 - I. Osteoarthrosis
 - II. Infectious arthritis
 - III. Rheumatoid arthritis
 - IV. Juvenile rheumatoid arthritis
 4. Developmental defects
 - i. Condylar agenesis
 - ii. Bifid condyle
 - iii. Condylar hypo/hyperplasia
 5. TMJ ankylosis
 6. Neoplasm
 - a. Benign tumor-osteoma chondroma, osteo-chondroma.
 - b. Malignant tumors-chondrosarcoma, fibro-sarcoma, synovial sarcoma.

2nd Classification “TMJ Disorder”

Tollers Classification

- A. Common disorder four groups
 - 1. Dysfunction
 - a. TMJ pain dysfunction syndrome
 - b. Myofascial pain dysfunction syndrome
 - 2. Internal joint derangement
 - 3. Degenerative disease
 - a. Osteoarthrosis
 - b. Ostoarthritis
 - c. Osteochondritis
 - d. Osteoarthropathy
 - 4. Trauma
 - a. Fracture
 - b. Dislocation
 - c. Traumatic arthritis
 - d. Synovitis
- B. Rare disorders: four groups
 - 1. Inflammatory disorder
 - a. Infection
 - b. Rheumatoid arthritis
 - 2. Ankylosis
 - a. Trauma
 - b. Infection
 - 3. Congenital
 - i. Hyper/hypoplasia of condyle
 - ii. Aplasia
 - 4. Neoplasm
 - a. Osteoma
 - b. Chondroma
 - c. Chondrosarcoma
 - d. Carcinoma.

3rd Classification "TMJ Disorders"

1. Disorders of condyle
 - A. Developmental
 - I. Agenesis
 - II. Hyperplasia
 - III. Hypoplasia
 - B. Traumatic
 - I. Fracture
 - II. Ankylosis
 - C. Neoplastic
 - I. Benign
 - a. Chondroma
 - II. Malignant
 - a. Chondrosarcoma
 - b. Chondroblastoma
2. Disorders of the meniscus disc
 - A. Displacement
 - I. With reduction
 - II. Without reduction
 - B. Osteoarthritis
3. Disorders of synovial apparatus
 - A. Acute inflammation
 - I. Traumatic
 - B. Chronic Inflammation
 - I. Rheumatoid arthritis
 - II. Psoriatic arthritis
 - III. Ankylosing spondylitis
 - IV. Suppurative arthritis
 - V. Gout
4. Disorder of associated fracture
 - A. Centrally mediated myalgia/myospasm- systemic disorder emotional stress.
 - B. Locally mediated myalgia/myospasm-occlusal dearangements, submassetric space infection.
 - C. Idiopathic MPDS.

4th Classification “TMJ Disorders”

1. Structural disorder arising within joints
 - A. Developmental
 - I. Hyperplasia - Condylar hyperplasia
 - II. Hypoplasia - Impaired growth
 - B. Trauma
 - I. Acute
Condylar fracture, birth trauma
 - II. Chronic
Internal derangement
 - C. Post traumatic - ankylosis
 - D. Degenerative condition
Osteoarthritis
Rheumatoid arthritis, still's disease
 - E. Metabolic - gout
 - F. Infection - contagious disease, e.g. TB, Syphilis
 - G. Tumors
 - I. Benign articular chondroma
 - II. Malignant chondrosarcoma
 - H. Rare Abnormalities
 - I. Suppurative arthritis
 - II. Aseptic necrosis
 - III. Functional
 - a. Disorder arising from structure outside the joint
 - b. Pain/dysfunction syndrome.

TEMPOROMANDIBULAR JOINT ANKYLOSIS (HYPOMOBILITY)

Different groups:

Group-A

1. False/fibrous pseudo
2. True/Bony

Group-B

1. Partial
2. Complete

Group-C

1. Intracapsular
2. Extracapsular

Group-D

1. Unilateral
2. Bilateral.

TEMPOROMANDIBULAR JOINT HYPERMOBILITY**Classified as:**

- Hypermobility of TMJ with pain
- Hypermobility of TMJ Without pain
- Habitual dislocation
- Fixed dislocation
- Acute dislocation
- Chronic recurrent dislocation
- Permanent prolong dislocation.

OROFACIAL PAIN**Basic classification of pain:**

1. Acute pain: It is of short that duration from noxious disease or recent injury it may be (I) mild (II) severe (III) dulltype.
2. Chronic pain: When the pain present for longer duration 3 to 6 months or more than it is labelled in chronic type patient is associatd with (I) Lowered pain there shold (II) Spontaneous and elicitted (Triggered) pain activity (III) Central behavioral changes.
3. Nociceptive type pain: Pain of none neural origin in which normal peripheral nerve endings are activated by inflammation or trauma that is affecting there tissue like skin, teeth, muscles, gland, bloodvessel. A

transmission from acute to chronic pain may occurs underlying cause, e.g. trauma not controlled.

4. Neuropathic pain: It is a chronic stage in which CNS has been sensitized by repetative direct or indirect injury or diseases. This is seen due to a series of changes in the nerve system.

2nd Classification “Orafacial Pain”

On the basis of differential diagnosis:

1. Typical orofacial pain of extracranial origin:
 - a. Dental causes—pulpitis poriapical lesion dentin hypersensitibility
 - b. Periodontal—primary herpetic gingivostomatitis ANUG. desquamative gingivitis
 - c. Mucosal ulceratian—aphthous or traumatic. Herpetic
 - d. Salivary gland—bacterial sialadenitis TMJ - Dysfunction
 - f. Paranasal sinus—sinusitus malignancy
2. Primary neuralgias:
 - a. Trigeminal neuralgias and variants
 - b. Glossopharyngeal neuralgia
 - a. Ram sayhunt syndrome
 - b. Postherpetic neuralgia
3. Vascular origin:
 - a. Migraine and variants
 - b. Cluster headache
 - c. Chronic paroxymal hemicranial headache
 - d. Giant cell arthritis and variant
4. Referred pain:
 - a. Occular pain
 - b. Anginal pain
 - c. ENT pain
 - d. MPDS
5. Psychogenic origin:
 - a. Atypical facial pain
 - b. Burning mouth syndrome.

NERVE—INJURIES

Seddon's Classification:

It is applied to both motor and sensory nerve:

1. Neuropraxia—mild-temporary injury caused by compression or retraction of the nerve, there is a temporary conduction block, sensory loss spontaneous recovery occurs within 4 week or less time no surgical intervention required.
2. Axonotmesis—more significant injury there is disruption or loss of continuity of some axons. There is prolonged conduction blocked General structure of the nerve and emulas intact. Initial sign of recovery of nerve function do not appear for 1 to 3 month after injury. Sensory nerve injury may develop persistant painful sensation (dysaesthesias).
3. Neurotmesis is complete severance there is a complete permanent conduction block of all impulses. The discontinuity gap between proximal and dental nerve come filled with scare tissue. No recovery is expected without surgical intervention.

FACIAL PARALYSIS

Etiology—classification classify mainly three major groups:

- A. Intracranial (central cause)
 1. Vascular abnormalities
 2. CNS degenerative disease
 3. Tumor of the intracranial cavity
 4. Trauma to the brain
 5. Congenital abnormalities and agenesis
- B. Intratemporal
 1. Bacterial and viral infection
 2. Cholesteatoma
 3. Trauma
 - a. Blunt temporal bone trauma

- b. Longitudinal and horizontal fracture of the temporal bone
 - c. Gunshot wounds
- 4. Tumors invading the middle ear mastoid and facial nerve
- 5. Introgenic cause
- 6. Extracranial
 - 1. Malignant tumors of the parotid gland
 - 2. Trauma—laceration gunshot wounds
 - 3. Introgenic cause
 - 4. Primary tumors of the facial nerve
 - 5. Malignant tumor of the ascending ramus of the mandible pterygoid region and skin.

FRACTURE OF MANDIBLE

1st Classification: On the basis of anatomic region (DINGMAN)

- 1. Midline—fracture between central incisors.
- 2. Parasymphysis—fracture between distal central incisor to distal canine.
- 3. Symphysis—fracture between distal canine to opposite distal canine.
- 4. Body—distal to canine to distal to third molar (teeth bearing area).
- 5. Angle—distal to 3rd molar region to triangular angle region.
- 6. Ramus—fracture in ramus region (superior to angle to apex of sigmoid notch).
- 7. Conylar process—area of condylar process (superior to ramus region).
- 8. Coronoid process—include the coronoid process (superior to ramus region).
- 9. Dentoalveolar process—region that would normally contain teeth.

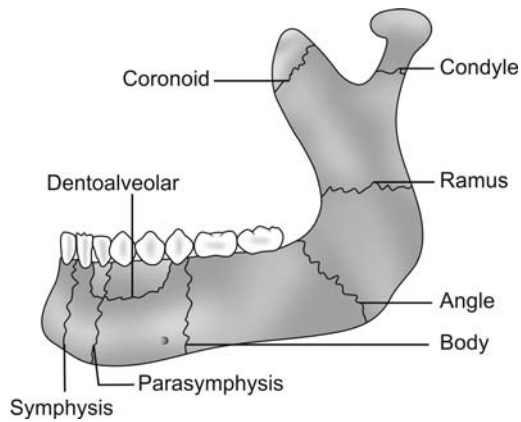


Fig. 4.4: Mandible fracture

2nd Classification:

1. Closed or simple fracture
2. Compound or open fracture
3. Communitied fracture
4. Complex or complicated fracture

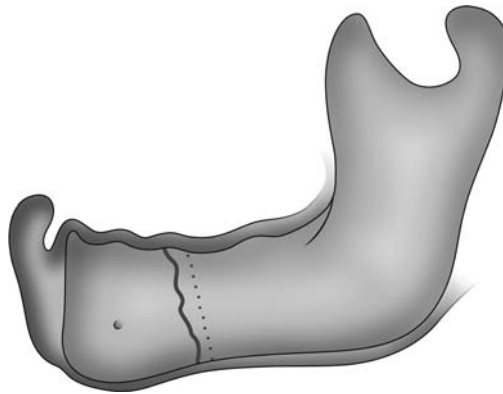


Fig. 4.5: Simple fracture

5. Multiple fracture
6. Impacted fracture
7. Atropic fracture
8. Pathologic fracture
9. Green stick fracture
10. Indirect fracture.

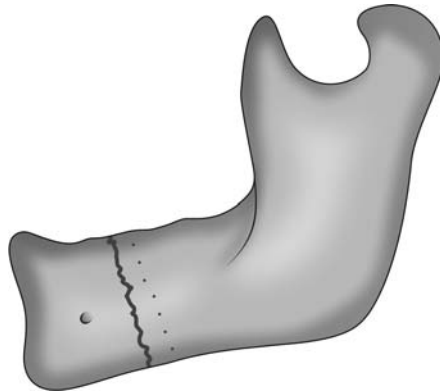


Fig. 4.6: Greenstick fracture

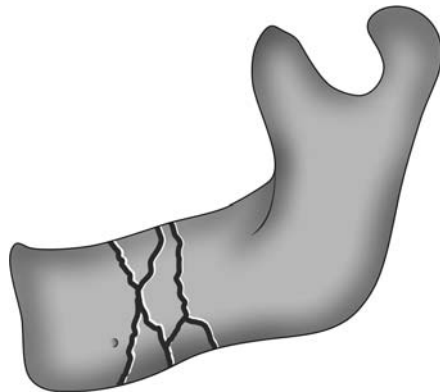


Fig. 4.7: Communitied fracture

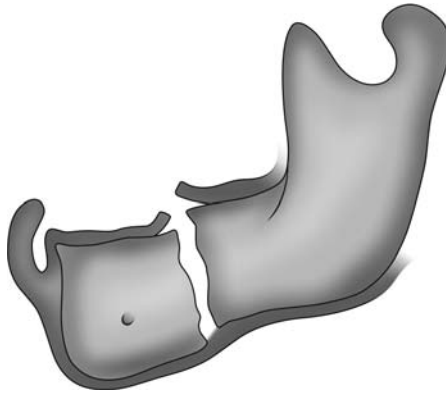


Fig. 4.8: Compound fracture

3rd Classification: Spiessel Classification

A-O classification of mandible fracture:

It has five components- "FLOSA"

1. F—fracture- number of fragments
2. L—locations of fracture
3. O—occlusion- status of occlusion
4. S—soft tissue involvement
5. A—associated fracture-parallel fracture of facial skeleton.

Classification of fracture by number of fragments and presence of bony defect:

- F0- Incomplete fracture
- F1- Single fracture
- F2- Multiple fracture
- F3- Communitied fracture
- F4- Fracture with a bone defect

Classification of fracture by site L1 to L8:

- L1 - Precanine
- L2 - Canine
- L3 - Postcanine

- L4 - Angular
- L5 - Supra-angular
- L6 - Processus articularis
- L7 - Processus muscularis
- L8 - Alveolar process

Classification of fracture by displacement:

- O0- Normal occlusion
- O1- Malocclusion
- O2- Edentulous mandible

Classification of fracture by soft tissue involvement:

- S0- Closed
- S1- Open intraorally
- S2- Open extraorally
- S3- Open intra-extraorally
- S4- Soft tissue defect

Associated fracture A0 to A6:

- A0 None
- A1 Fracture or loss of tooth
- A2 Nasal bone
- A3 Zygoma
- A4 LeFort - I
- A5 LeFort - II
- A6 LeFort - III

4th Classification:

“Kazanjian Classification” on the basis of presence or absence of teeth:

Class I: Teeth are present on both side of fracture line.

Class II: Teeth are present only one side of the fracture line.

Class III: The patient is edentulous.

5th Classification: “Kruger Classification”

- I. Simple classification
- II. Composed fracture
- III. Comminuted fracture

6th Classification:

“Row and Killey’s based on involvement of basal bone”
divided in two classes:

1. Those involving basal bone:
 - Single—unilateral
 - Double—unilateral, bilateral, multiple
2. Those not involving basal bone: Alveolar process fracture
 1. Involving basal bone of mandible:
 - Single unilateral fracture
 - a. Condyle
 - I. Intracapsular
 - II. Extracapsular
 - III. Fracture dislocation
 - b. Coronoid fracture
 - I. Nodisplacement
 - II. Displacement
 - c. Ramus fracture
 - I. Linear horizontal fracture
 - II. Linear vertical fracture
 - III. Stable type fracture
 - d. Angle and body fracture
 - I. Horizontally favorable
 - II. Horizontally unfavorable
 - III. Vertically favorable
 - IV. Vertically unfavorable
 - e. Canine Fracture
 - I. Lenar fragment - Laterally displaced
 - II. Lenar fragment medially displaced
 - f. Symphysis
 - I. Midline fracture
 - II. Oblique fracture

- Bilateral fracture—bilateral dislocation of condyle
Bilateral horizontally and vertically unfavorable fracture
Bilateral fracture in the canine region.
- 2. Not involving basal bone “alveolar” fracture.

Angle Classification of Mandible

Mainly divided into four categories

- A. Horizontal favorable angle fracture—fracture line extended from upper border to lower border or downward anteriorly.
 - undisplaced fractured fragment
 - occlusion normal
 - can be seen on OPG.
- B. Horizontal unfavorable fracture—fracture line extended from upper border to downward posteriorly.
 - displaced fractured fragment
 - occlusion
 - can be seen on OPG.

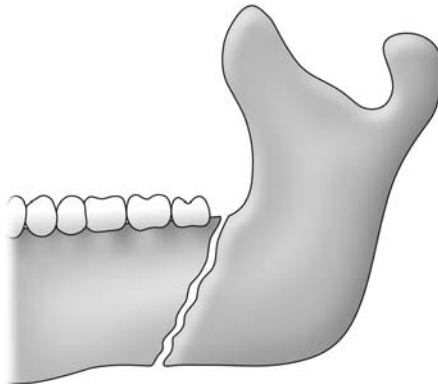


Fig. 4.9: Horizontal favorable angle fracture

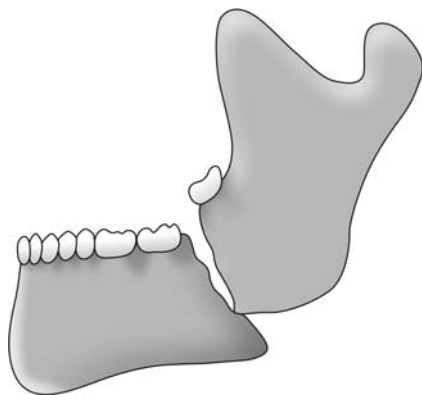


Fig. 4.10: Horizontal unfavorable angle fracture

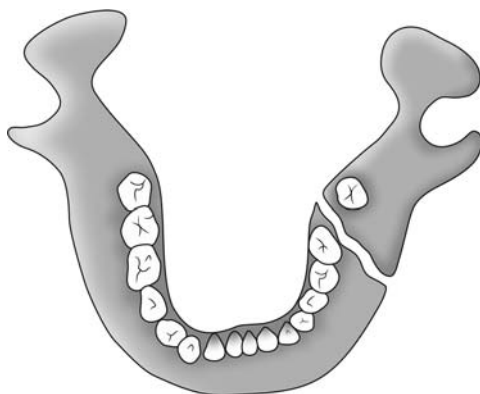


Fig. 4.11: Vertical favorable angle fracture

- C. Vertically favorable angle fracture—fracture line extended from buccal plate anteriorly and backward through lingual plate posteriorly.
 - Can be seen on occlusal view
- D. Vertically unfavorable angle fracture—fracture line extended from lingual plate anteriorly backward through the buccal plate posteriorly.
 - Can be seen on occlusal view

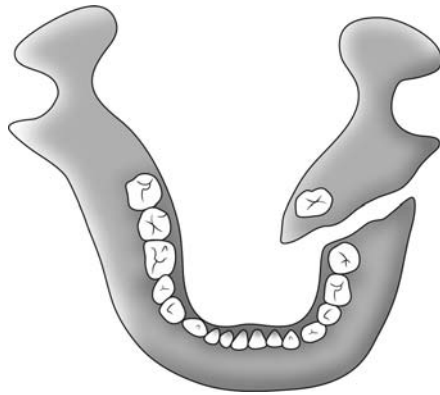


Fig. 4.12: Vertical unfavorable angle fracture

Condylar Fracture of Mandible

1st Classification: On the basis of radiographic reading lindal classification:

- A. Fracture level:
 - I. Condylar head
 - II. Condylar neck
 - III. Subcondylar
- B. Relationship of condylar fragment to the mandible:
 - I. Undisplaced
 - II. Deviated
 - III. Displaced with medial overlapping of condylar fragment
 - IV. Displaced with lateral overlapping of condylar fragment
 - V. Without contact between the fragment
- C. Relationship of condylar head to fossa:
 - I. No displacement
 - II. Displacement
 - III. Dislocation

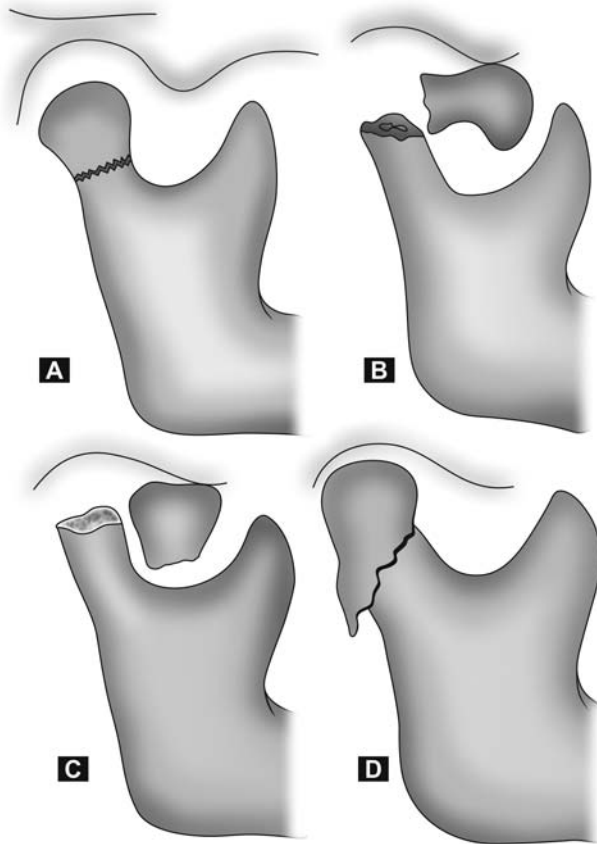


Fig. 4.13: Condylar fracture (A) No displacement (B) Forward dislocation (C) Medial dislocation (D) Lateral dislocation

2nd Classification by Maclellan

Mainly four categories:

- i. No displacement
- ii. Fracture deviated
- iii. Fracture displacement
- iv. Fracture dislocation

3rd Classification- Simple Classification

- A. Intracapsular
 - Unilateral
 - Bilateral
- B. Extracapsular
 - Unilateral
 - Bilateral

4th Classification- Rowe and Killey's Classification

- A. Intracapsular or high condylar fracture:
 - I. Fracture involving the articular surface rare.
 - II. Fracture above or through anatomical neck which do not involve the articular surface.
- B. Extracapsular or low condylar or subcondylar fracture—here the fracture runs from lowest point of curvature of the sigmoid notch, obliquely downward and backward below the surgical neck of the condyle to the posterior aspect of upper part of ramus
- C. Fracture associated with injury to the capsules ligament and meniscus
- D. Fracture involving adjacent bone.

5th Classification- Wassermann Classification

- A. TYPE I- Fracture of the neck of the condyle.
- B. Type II- Angle between head and ramus 45 to 50 degree.
- C. Type III- Fragments are not in contact—fragments are generally confined within the area of glenoid fossa. Capsule is torn and head is outside of the capsule. Open reduction advocated.
- D. Type IV- Fracture head articulates on or forward to the articular eminence.
- E. Type V- Vertical oblique fracture through the head of the condyle-rare.

6th Classification- Thoma in 1945 considered direction of displacement:

- a. Condylar fracture:
 1. Without displacement of condyle:
 - I. Greenstick fracture
 - II. Intracapsular
 - III. Extracapsular
 2. With displacement of condyle:
 - I. Lateral
 - II. Medial
 - III. Forward
 - IV. Backward
 3. With overriding of fragments
 4. With dislocation in lateral and medial direction:
 - I. Intracapsular
 - II. Complete fracture dislocation
 - III. Dislocation of fracture part of head of condyle
 5. With dislocation in forward direction:
 - I. Anteriorly from articular eminence
 - II. Posterior from articular eminence
 - III. With dislocation and displacement of meniscus
 - IV. With comminution
 - V. Old fracture with deformity:
 - a. Pseudoarthrosis
 - b. Ankylosis
- B. Subcondylar fracture:
 - i. Without displacement of fracture
 - ii. With displacement of fracture

7th Classification- Spiessel Schroll 1972

- A. Nondisplaced fracture

- B. Low neck fracture with displacement
- C. High neck fracture with displacement
- D. Low neck fracture with dislocation
- E. High neck fracture with dislocation
- F. Head fracture

8th Classification on Rowe and Killeys

- A. Simple fracture of condyle
- B. Compound fracture of condyle
- C. Comminuted fracture- associated with zygomatic arch fracture.

MIDDLE THIRD FACIAL SKELETON

1st Classification:

Rowe and Killey 1968 on an anatomic basis:

- A. *Fracture not involving the occlusion:*
 - 1. Central region
 - a. Fracture of nasal bone or nasal septum
 - I. Lateral nasal injury
 - II. Anterior nasal injuries
 - b. Fracture of the frontal process of maxilla
 - c. Fracture of type a and b which extend into the ethmoid bone [Naso ethmoid]
 - d. Fracture of type a, b and c which extend into the frontal bone (fronto-orbito-nasal dislocation).
 - 2. Lateral region
 - a. Fracture involving the zygomatic bone
 - b. Excluding dentoalveolar component
- B. *Fracture involving the occlusion*
 - 1. Dentoalveolar fracture

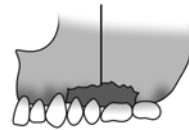
2. Subzygomatic fracture

a. LeFort - I [Low level, Horizontal fracture Guérins fracture]

b. LeFort - II [Pyramidal fracture]

1. Dentoalveolar

Dentoalveolar fracture



2. Subzygomatic

A. LeFort or low level or Guérin



B. LeFort II or pyramidal

3. Suprazygomatic

C. LeFort III or high level or craniofacial dysjunction



Fig. 4.14: Fracture of middle-third of facial skeleton

3. Suprazygomatic fracture

LeFort - III [High level fracture craniofacial junction]

LeFort - IV fracture [Pure frontal bone fracture]

2nd Classification:

- Rene LeFort divided into 3 groups:
 1. LeFort I
 2. LeFort II
 3. LeFort III

3rd Classification:

- Erich's: On the basis of direction of fracture line
 - a. Horizontal fracture
 - b. Pyramidal fracture
 - c. Transverse fracture

4th Classification:

Depending on the relationship of the fracture line to the zygomatic bone.

- I. Below the zygomatic is subzygomatic fracture
- II. Above or including the zygomatic bone known as superzygomatic bone.

5th Classification:

Depending on the level of the fracture line

- I. Low level fracture
- II. Mid level fracture
- III. High level fracture

6th Classification:

"Middle third of facial skeleton": modified LeFort fracture proposed by Marciani 1993 to more precisely define LeFort NOE and zygomaticomaxillary fracture pattern

LeFort I – Low maxillary fracture.

I a - Low maxillary fracture multiple segment.

LeFort II – Pyramidal fracture.

II a - Pyramidal and nasal fracture.

II b - Pyramidal and NOE fracture.

LeFort III – Craniofacial dysjunction.

III a - Craniofacial dysjunction and nasal fracture.

III b - Craniofacial dysjunction and NOE fracture.

LeFort IV – LeFort II or III Cranial base fracture.

IV a + Supraorbital rim fracture.

IV b + Anterior cranial form and supraorbital rim fracture.

IV c + Anterior cranial forms orbital wall fracture.

7th Classification:

Rowe and William's 1985

A. Fracture not involving the dentoalveolar component.

Central zone:

- a. Fracture of the nasal bone or nasal septum
 - I. Lateral nasal injury
 - II. Anterior nasal injury
- b. Fracture of the frontal process of the maxilla.
- c. Fracture of type a and b which extend into the ethmoid bone (NE).
- d. Fracture of type a, b and c which extend into the frontal bone.

Lateral region:

Fracture involving the zygomatic bone arch and maxilla (zygomaticomaxillary complex) excluding the dentoalveolar components.

B. Fracture involving the dentoalveolar components.

Central region:

- I. Dentoalveolar fracture
 - a. Introgenic fracture of maxillary tuberosity.
 - b. Floor of the maxillary dentrum (occurs during extraction of maxillary third and second molar).
- II. Subzygomatic fracture
 - a. LeFort - I (Low level or Guerins)
 - b. LeFort - II (pyramidal)

The above fracture may be unilateral or associated with fracture of zygomatic bone.

Combined central and lateral region fracture:

- a. LeFort - III High level suprazygomatic fracture.

- b. LeFort - III with middle split.
- c. LeFort - III with midline split—fracture of the roof of the orbit or frontal bone.

ZYGOMATIC COMPLEX FRACTURE

I. Classification Rowe and Killey 1968:

Type I—No significant displacement

Type II—Fracture of the zygomatic arch

Type III—Rotation around the vertical axis

a. Inward displacement of orbital rim

b. Outward displacement of orbital rim

Type IV—Rotation around the longitudinal axis

a. Medial displacement of the frontal process

b. Lateral displacement of frontal process

Type V—Displacement of the complex enbloc:

a. Medial

b. Interior

c. Lateral (rare)

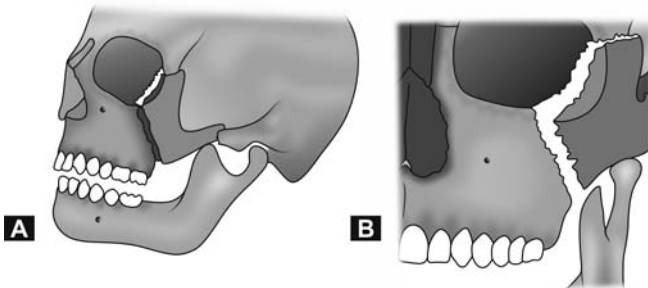
Type VI—Displacement of the orbitocentral rim segment

Type VII—Complex comminuted fracture

II. Classification Larsen and Thompson 1968:

Very simple and practical classification.

Group A: Stable fracture—show minimal or no displacement and require no intervention.



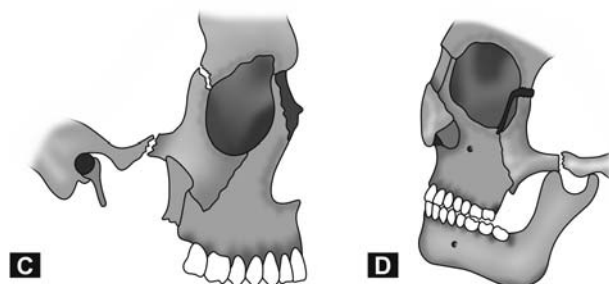
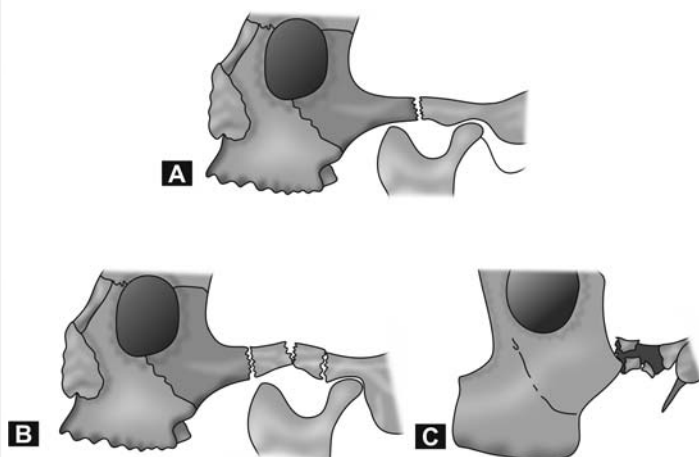
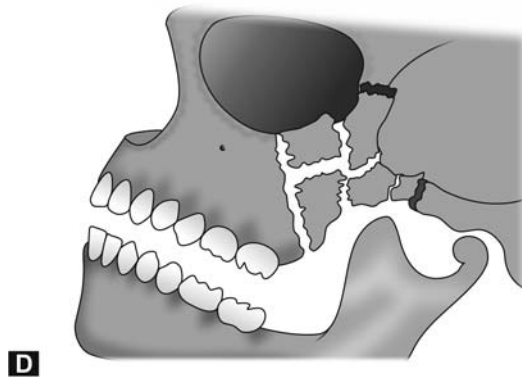


Fig. 4.15 A to D: Rowe and Williams ZMC fracture

Group B: Unstable fracture—with great displacement and disruption of the frontozygomatic fracture and comminuted fracture requires reduction as well as fixation.

Group C: Other type of zygomatic fracture which require reduction but no fixation.





Figs 4.16 A to D: A Minimal or no displacement; (B) V-type in-fracture; (C) Comminuted; (D) Larsan and Thompson ZMC

III. Fracture of the zygomatic arch alone not involving the orbit can be classified as follows:

1. Minimum no displacement
2. V type in fracture
3. Comminuted fracture.

ORBITAL FRACTURE

Isolated orbital fracture are not of common occurrence:
Associated with orbital rim and other maxillofacial bones.
It can be categorized as follows:

- Fracture of orbital rim
- Fracture of the orbital walls
- Blow out fracture
- Blow in fracture.

NASOETHMOID ORBITAL FRACTURE

(NOE {Naso-orbital ethmoidal} Complex Fracture)

On the basis of status of MCT (Medial Canthal Ligament);
following three groups:

Type I: In its simple form, NOE fractures are isolated involving only the portion of the medial orbital rim that contains medial canthal tendon. Type I pattern consists of single central fragment bearing medial canthus. These fracture may be bilateral, complete or displaced. Uncommonly the MCT is torn or avulsed completely from an intact medial wall.

Type II: These fractures are complete and may be unilateral or bilateral. They may be single segment or comminuted external to the medial canthal insertion in the central segment. Therefore, the MCT maintains continuity with a relatively large fractured segment of bone, which may be used in the surgical reduction.

Type III: Communication within the central fragment allow fracture to extend beneath the canthal insertion characterizing the type III fracture pattern. The canthus is rarely avulsed but it is attached to bone fragment that are too small to utilize in reconstruction.

TRACHEOSTOMY

1st Classification:

- A. Emergency tracheostomy
- B. Elective tracheostomy

2nd Classification:

- A. Temporary
- B. Permanent as with laryngotomy

3rd Classification:

- A. High tracheostomy performed above the isthmus of the thyroid gland.
- B. Mid tracheostomy at the level of isthamus.
- C. Low tracheostomy performed below the isthmus.

TNM STAGING

TNM Classification/staging

- T - Extent of the primary tumor
- N - Condition of the regional lymph nodes
- M - Absence/presence of distant metastasis.

Primary Tumor [T]

- TX: Tumor that cannot be assessed by rules
- T0: No evidence of primary tumor
- Tis: Carcinoma *in situ*
- T1: Tumor 2 cm or less in greatest diameter
- T2: Tumor greater than 2 cm but less than 4 cm
- T3: Tumor greater than 4 cm in greatest diameter
- T4: Massive tumor greater than 4 cm in with diameter with deep invasion muscle, tongue, skin.

Nodal Involvement [N]

- NX: Regional lymph node cannot be assessed
- N0: Regional lymph node not palpable
- N1: Movable ipsilateral nodes
- N1a: Nodes considered not to contain tumor
- N1b: Nodes consider to contain tumor growth
- N2: Movable contralateral or bilateral nodes
- N2a: Nodes considered not to contain tumor growth
- N2b: Nodes considered to contain tumor growth
- N2c: Bilateral or contralateral lymph node upto 6 cm
- N3: Fixed lymph nodes, lymph nodes greater than 6 cm.

Distant Metastasis [M]

- MX: Distant metastasis cannot be assessed
- M0: No distant metastasis.

Staging of oral cancer: (TNM) (T = Tumor, N = Nodes, M = Metastasis)

Stage I T1 N0, N1a, N2a M0

Stage II	T2	N0, N1a, N2a	M0
Stage III	T3	N0, N1a, N2a	M0
Stage IV	Any T	N1b, Any N2b, N3, Any N	M1

NECK DISSECTION

Classification is as follows:

1. Radical neck dissection (RND): Removal of all cervical lymphatics and lymph node from the level of the spinal level I and V with sacrifice of the spinal accessory. The sternocleidomastoid muscle and internal Jugular vein.
2. Modified radical neck dissection (MRND): Involves the removal of cervical lymphatic and lymph nodes from levels I to V.

Along with the one or more of the non lymphatic structure mention below:

- a. Spinal accessory nerve (SAN)
 - b. The internal jugular vein (IJV)
 - c. The sternocleidomastoid muscle (SCM)
3. Selective neck dissection (SND): This refers to the cervical lymphadenectomy in which there is preservation of one or more lymph node group that are routinely removed in MRND along with preservation of the SAN, IJV and SCM. The lymph node group removed depends upon the pattern of metastasis relative to the primary site of the tumor. SND I-III will be performed as a staging procedure.
 4. Extended neck dissection: When lymph node groups or non lymphatic structure other than the once removed in a RND need to be removed.
For example: External carotid artery
Level VI node, etc.
It is called an extended neck dissection.

CLEFT PALATE AND CLEFT LIP

1st Classification:

Davis and Ritchie divided into three groups:

Group 1: Prealveolar cleft (uni/bilateral)

Group 2: Post alveolar cleft

Group 3: Complete alveolar cleft (uni/bilateral)

2nd Classification:

Professor Balkrishnan has modified and his classification is as follows:

Group 1: Cleft of lip alone (complete, incomplete, subsurface, unilateral, bilateral)

Group 2: Cleft of palate alone (hard and soft palate only, submucous cleft)

Group 3: Cleft of lip, alveolus and palate (uni/bilateral)

3rd Classification:

Internationally approved classification 1967:

- A. *Group 1:* Cleft of the anterior (Primary palate)
 - a. Lip: unilateral RT/LT—total or partial bilateral
 - b. Alveolus: unilateral right left total or partial bilateral
- B. *Group 2:* Cleft of ant and Post (Primary and secondary) palate
 - a. Lip: unilateral RT/LT (Total partial) bilateral
 - b. Alveolus: unilateral right left total or partial bilateral
 - c. Hard palate RT/LT total or partial
- C. *Group 3:* Clefts of posterior (secondary) palate
 - a. Hard palate RT/LT
 - b. Soft palate
- D. *Group 4:* Rare facial clefts

4th Classification:

Group 1: Cleft of the soft palate only

Group 2: Cleft of hard and soft palate

Group III: Complete unilateral cleft extending from uvula to incisive foramen.

DENTAL IMPLANT

Classification:

1. According to the relationship to bone:
 - a. Endosteal implant
 - b. Subperiosteal implant
 - c. Transosteal implant
2. According to implant tissue interface:
 - a. Direct interface implant
 - b. Indirect interface implant
3. According to functional performance of implant:
 - a. Retentive implant
 - b. Supportive implant
4. According to the type of the implant:
 - a. Implants made up of metals and alloys:
 - I. Titanium
 - II. Stainless steel
 - III. Cobalt chromium
 - b. Implant made up of polymers:
 - I. Polyethylene
 - II. Polysulfone
 - c. Implants made up of ceramics:
 - I. Aluminum oxide
 - II. Hydroxyapatite
 - d. Implant made up of carbon: Vitreous carbon implant
5. According to shape of the implant:
 - I. Mucosal implant
 - II. Mandibular staples
 - III. Hollow basket implant
 - IV. Screw implant
 - V. Bladevent implant
6. According to design of implement:
 - a. Endosseous implant
 - I. Screw
 - II. Cylinders

- III. Blades
- IV. Pins
- b. Site periosteal implant
 - I. Complete arch implant
 - II. Unilateral Nepiece implant
 - III. Two piece implant
- c. Transosseous implant
 - I. Single pin staples
 - II. Multiple pin staples.

CLASSIFICATION OF JAW DEFORMITIES

1st Classification:

1. Congenital deformities—may be unilateral/bilateral.
May be associated with 'subcondition'.
 - I. Trecher Collins syndrome
 - II. Craniofacial dysostosis
 - III. Cleft lip and cleft palate
 - IV. Branchial arch syndrome
 - V. Goldenhar syndrome
2. Developmental deformities:
 - A. Congenital anomalies
 - I. Congenital facial paralysis
 - II. Hemangioma
 - B. Trauma
 - I. Condylar fracture
 - II. Facial burns
 - C. Abnormal neuromascular pattern
 - I. Asymmetrical maxillary and mandibular growth
 - II. Open bite
 - D. Infection: Osteomyelitis
 - E. Endocrinal imbalance: Acromegaly [mandibular prognathism]
 - F. Nutritional deficiency: Vitamin D deficiency

- G. Arthritis
 - I. Juvenile arthritis
 - II. TMJ ankylosis
- 3. Acquired deformities:
 - A. Loss of bone—partial or total resection of mandible and maxilla
 - B. Traumatic deformities

2nd Classification:

Maxillary mandibular and chin deformities

Maxillary Deformities:

- A. Maxillary anteroposterior excess: Protrusive maxilla—overgrowth in anterior horizontal direction in second molar.
- B. Maxillary anteroposterior deficiency: Inadequate growth of maxilla in an anterior I direction - class III.
- C. Vertical maxillary excess: Overgrowth of maxillary alveolus in inferior direction, incompetent lip scar, without mentalis muscles strain.
- D. Vertical maxillary deficiency Edentulous appearance showing no teeth deep bite prominent button chin.
- E. Transverse maxillary deficiency.
- F. Alveolar cleft.

Mandibular Deformities

- A. Mandibular AP Excess (Hyperplasia).
- B. Mandibular AP deficiency (Hypoplasia).
- C. Mandibular AP Asymmetry: Clinically chin mandibular midline shift.

Chin Deformities

- A. Macrogenia
- B. Microgenia

Combined Maxillary Mandibular Deformities

- A. Short face syndrome:
Brachyfacial: Deficient lower facial growth in vertical dimension low mandibular occlusal plane angle II with mandible AP deficiency.

Some time with vertical maxillary deficiency.

B. Long face syndrome:

Dolicofacial: Excess lower facial height. Increased occlusal mandibular plane often a combination of vertical maxillary excess with mandibular hypoplasia.

C. Apertognathia:

I. Often with long face syndrome.

II. Lower facial asymmetry.

Chapter

5

Management (Different Lesions/Diseases Conditions/Disorders)

Chapter Outline

- Shock
- Syncope
- Dental Treatment in Hemophilic Patient (Surgical)
- Bleeding in Exodontia
- Postextraction Trismus
- Dry Socket
- Postextraction Edema
- Postoperative Paresthesia (Numbness)
- Facial Paralysis due to Local Anesthesia
- Toxicity due to Overdose of Local Anesthesia
- Allergic Reaction due to Local Anesthesia
- Cellulitis
- Acute Alveolar Abscess
- Pericoronitis
- Osteomyelitis
- Osteoradionecrosis
- Ludwig's Angina
- Cavernous Sinus Thrombosis
- Acute and Chronic Maxillary Sinusitis
- Removal of Root/Tooth/Foreign Bodies from Maxillary Sinus
- Management of Oroantral Fistula
- Trigeminal Neuralgia
- Facial Paralysis
- Bell's Palsy
- Cyst of Jaw and Oral Cavity
- Tumors of Jaw and Oral Cavity
- Temporomandibular Joint Surgery

Contd...

Contd...

- Temporomandibular Joint Ankylosis (Hypomobility)
- Temporomandibular Joint Hypermobility (Subluxation)
- Temporomandibular Joint Dislocation (Luxation)
- Myofacial Pain Dysfunction Syndrome
- Salivary Gland Disease
- Sialadenitis
- Sialadenosis or Sialoses
- Sialorrhea or Ptyalism
- Salivary Gland Tumor/Pleomorphic Adenoma of Parotid Gland
- Salivary Fistula/Parotid Fistula
- Frey's Syndrome
- Xerostomia
- Primary Assessment and Management of a Patient with Maxillofacial Injuries
- Mandible Fracture
- Maxilla Fracture
- Zygomatic Complex Fracture
- Orbital Fracture
- Nasal Fracture
- Naso-ethmoidal-Orbital Fracture
- Preprosthetic Surgery
- Precancerous Lesion
- Oral Cancer
- Cleft Lip and Palate
- Cardiopulmonary Resuscitation
- Postoperative Care of Tracheostomy Patient
- Epileptic Attack (Convulsion) During Dental Procedure
- General Care of Surgical Patient

SHOCK

Shock can be more easily prevented than treated. Hypovolemic shock results from decrease in the circulating volume. Hypovolemic shock is the most common type seen in maxillofacial trauma.

Principles of Management

1. Patient position: Patient should be put in shock position, i.e. 15 degrees Trendelenburg position. It means that

- patient should be in supine position with head at a lower level than the heart and the legs are raised.
2. Assure oxygen exchange: Good oxygen exchange is mandatory. Hundred percent oxygenation also helps to maintain body metabolism and body heat.
 3. Insure hemostasis: Any ongoing bleeding should be controlled. This may be accomplished by pressure or direct ligation of severed vessels.
 4. Maintain the body heat: The patient is covered with blankets to maintain the body heat.
 5. Restoration of vascular volume and extracellular fluid volume:
 - One or two liters of Ringer's lactate or equivalent solution may be helpful.
 - If the cause of shock is blood loss then, further therapy should be either fresh whole blood or component blood therapy.
 - Lactated Ringer's solution does have one major disadvantage: Transfused blood will coagulate if it runs through an intravenous line (IV) which contains lactate Ringer's solution. So normal saline should be flushed through the line before any stored blood is administered.
 - Volume replacement with the help of colloidal plasma substitute is "Dextran" and crystalloid plasma substitute, i.e. normal sodium chloride 0.9 percent and dextrose solution 5 percent.
 - Colloidal substitute are superior to crystalloid in maintaining vascular volume and reduce shock level.
 6. To correct acid-base imbalance (metabolic acidosis):
 - Hypovolemic shock is usually associated with metabolic acidosis. As tissue hypoxia increases the production of lactic acid increases.
 - Advised: Injection sodium bicarbonate ampule intravenously (IV) (dose can be repeated)

Metabolic alkalosis:

- Very uncommon.
 - It is due to hypokalemia.
 - Advised: Potassium chloride 10 to 20 mg/hr.
 - If alkalosis persists: Tab acetazolamide (Tab Diamox 0.25 gm) as single dose.
 - Diamox reduce the hydration of CO₂.
7. Relief of symptoms "Pain and anxiety":
- Medication should be used to control pain.
 - If there is no head injury or respiratory distress, then small dose of IV narcotic is advisable. Injection morphine 2.5 to 5 mg IV, 10 mg intramuscularly (IM) or Injection pethidine 100 mg IV.

Drug Therapy

1. Vasopressor: Injection mephentermine for hypotension to elevate the blood pressure.
2. Antibiotic:
 - Broad-spectrum antibiotic are also administered (in case of septic shock through IV route).
 - Steroids: Controversy still exists. Small dose of IV steroid is usually advised. If indicated, large doses are advised.
 - Atropine sulfate: 0.65 mg is diluted in 5 ml of distilled water and 0.5 ml of this solution is given slowly IV, followed by another 0.5 ml if radial pulse is not clearly palpable.
3. Vasoconstrictor:
 - Role of vasoconstrictor is insignificant. It should be used with caution especially in presence of hemorrhage.
 - 1 ampule 1:1000 strength adrenaline diluted in 10 ml of distill water and 0.5 ml of this solution is given very slowly, followed by 1 drop/minute till a good thrust is felt for radial pulse.

4. Monitor vital signs:
 - Several parameters should be noted.
 - Vital signs like blood pressure should remain stable.
 - Renal flow should be greater than 20 ml/hr, preferably greater than 30 ml/hr.
 - Decreased urinary output means either inadequate volume replacement or early renal failure.
5. Arterial blood gases: The goal is to maintain acid-base balance which means to maintain sufficient pO_2 . Fluid replacement usually corrects the metabolic acidosis. Bicarbonate is rarely needed.

SYNCOPE

Management

1. Patient and dental chair position: Patient should be in supine position with or slightly below the level of heart 15 degree Trendelenburg position.
2. Dental procedure should be discontinued and dental chair light should be switched off.
3. The tight clothing should be loosened.
4. Check for the patency of the airway. Aspiration of stomach contents could precipitate as life-threatening emergency.
5. Monitor blood pressure and pulse.
6. Elevate the feet straight up. From the supine position, it will redistribute at least 1000 cc, of blood to the circulating volume in the area above the waist and rapidly help to restore adequate cerebral circulation and oxygenation.
7. Foreign objects should be removed from the mouth and excessive salivary secretion should be suctioned.
8. Inhalation of aromatic spirit ammonia, it will stimulate respiration.

9. If there is any indication that patient is likely to vomit, patient should be turned laterally (preferably onto his/her left side).
10. If patient is conscious, he/she is instructed to take deep breath.
11. Hundred percent oxygen should be administered if air hunger is present.
12. If syncope is due to loss of fluid then administer IV dextrose 5 percent.
13. In case vital signs remain low and bradycardia is present, then administer injection atropine 0.4 mg IV.
14. Use of vasopressor: If hypotension persists despite absence of bradycardia, administer methoxamine HCl IV 5 mg which act mainly by vasoconstriction.

DENTAL TREATMENT IN HEMOPHILIC PATIENT (SURGICAL)

Routine Surgical Procedure

- A. Anesthesia:
 - Local anesthesia is preferable.
 - Mandibular nerve block is absolutely contraindicated.
 - Periodontal membrane (ligament) local anesthesia technique is advisable. Contamination may cause infection but it is good analgesia.
- B. Use of local hemostatic agents:
 - Oxidized cellulose saturated with bovine thrombin sodium bicarbonate solution is used in individual root socket.
 - Use of mechanical device to protect the clot from dislodgement.
- C. Use of mechanical splints:
 - There is almost universal agreement that once a clot forms, it must be protected against dislodgement.

- Splint must be used without applying undue pressure.

D. Use of suture:

- Use of sutures is controversial.
- Those in favor of sutures suggests that sutures aid in protection of the clot. They should be small and minimum in number.
- On the other hand, socket should not be sutured because not only the wound would bleed because of needle insertion also the blood which could not escape into the mouth would be directed down the fascial plane of the neck.
- If the patient does bleed postoperatively blood can flow into the mouth where it can be seen and can be treated.
- A small cotton swab soaked in Surgicel should be placed over the socket with gentle pressure untill coagulation occurs.
- Generally missing factor replaced by IV route.

Postoperative Regime

- Absolute bed rest
- Patient should be in sitting position
- Immobilize the mandible if required
- Liquid diet
- Minimum talking
- No alcohol
- Patient should be sedated
- Patient must be hospitalized
- Additional booster dose of missing factor VIII should be administered daily.
 - Analgesic like aspirin is absolutely contraindicated.
 - Drugs used as systemic administration are:

- a. Epsilon aminocaproic acid “Amicar”: An antifibrinolytic substance. To increase the stability of clot.
- b. Tranexamic acid “Cyklokapron”: Reduced plasminogen activity. Tab 0.5 gm, three times a day.
- c. Desmopressin 0.3 mg/kg IV.
- E. Use of factor VIII replacement:
 - Fresh frozen plasma
 - Fresh whole blood and plasma
 - Cryoprecipitate prepared from human plasma
 - Freeze dried animal and human anti-human globulin (AHG).

BLEEDING IN EXODONTIA

During extraction of tooth five basic steps to control the bleeding:

1. To compress the socket.
2. To pack the bleeding socket with wet gauge piece.
3. In normal patient—pack the bleeding socket with local hemostatic “adrenaline” (1:1000).

In case, the patient is hypertensive or cardiac status —pack the bleeding socket with Hem-o-lok or Sepguard, etc.

4. Suturing of the bleeding socket.
5. Use of systemic hemostatic agent—oral or parenteral.
For example, Streptobion, Chromostate, CVP, vitamin K, etc.

Postextraction Bleeding

1. Clean the area and suction.
2. Advise radiograph of that area.
3. If indicated, administer injection diazepam 5 to 10 mg intramuscular or IV as sedative.

4. If physical status indicates dehydration, administer dextrose 5 percent.
5. If any foreign body is present at the site of bleeding it should be removed.
6. If bleeding is from the soft tissue, suture the area under tension.
7. If bleeding is from bone, apply small amount of bone wax.
8. If bleeding is generalized from alveolus, pack the socket with gelatin sponge.
9. Instruct the patient to place a large guaze piece and close the mouth for 2 hours.
10. Advise ice fomentation, it may reduce the bleeding.

POSTEXTRACTION TRISMUS

1. The trismus (difficulty in opening mouth) may be result of multiple injection of local anesthesia. Most commonly involved muscle is "medial pterygoid muscle" during inferior alveolar nerve block.
2. If there is infection, start antibiotic therapy, analgesic, anti-inflammatory and muscle relaxant.
3. If the condition is severe, then advise tablet diazepam 5 mg.
4. Advise vigorous mouth exercise with mouth gag or mouth prop.
5. If there is no infection, then warm saline gargle or hot fomentation is also helpful.

DRY SOCKET

- It is one of the postextraction local complication seen after 3rd to 5th day.
- The treatment of dry socket is preliminary toward the relief of pain.

- Since the patient is under severe pain, prompt treatment is required. It can be accomplished in two ways:
Local therapy:
 - a. It consists of irrigation of the socket with a dilute hydrogen peroxide and antiseptic solution (Betadine) with normal saline—to remove necrotic material and debris.
 - b. To inspect the socket for any root pieces, bone pieces or foreign body, etc.
 - c. Then use topical anesthesia benzocaine or xylocaine jelly on a sterile gauze and pack the socket.
 - d. In addition to local therapy, medication like analgesic, anti-inflammatory and antipyretic should be prescribed. Supplementary drug containing zinc should be given.
 - e. If pain subsides: No need to replace the dressing.
 - f. If pain persists: Again irrigate the socket and replace the socket.
- Routine antibiotic therapy in the management of dry socket is not recommended.
- Curettage is not recommended in the treatment of dry socket. This procedure not only predispose the patient for further spread of infection but also destroys any previous attempt at normal healing.

POSTEXTRACTION EDEMA

- Edema means “increase in size of soft tissue”.
- If postextraction edema is due to infection: Antibiotic therapy with analgesic, anti-inflammatory and supplementary drugs are advised.
- If edema is due to surgical trauma:
 - a. Advise ice fomentation/cold diet.
 - b. Serrazine peptidase with analgesic and anti-inflammatory.

- c. Antipyretic and antibiotic therapy if chances of infection is suspected.
- Hot saline gargle only if there is no infection.
- Generally edema subsides postoperatively in 3 to 5 days.
- If edema is due to hematoma:
 - a. Direct pressure may control the condition immediate after incidence.
 - b. Ice fomentation may reduce the size.
 - c. Antibiotic therapy is advised to prevent infection.
 - d. Generally hematoma subsides after 3 to 5 days.

POSTOPERATIVE PARESTHESIA (NUMBNESS)

- Generally it is due injury to lingual nerve, inferior alveolar nerve and mental nerve.
- Condition may subside within few weeks to months (180 days) as nerve fibers regenerate.
- If it is severe, promote regeneration of nerve fibers. Advise vitamin B-complex preparation.
 - i. Tab/Injection Neurobion forte
 - ii. Tab Neurokind more or OD for 15 days to a month or as required.

FACIAL PARALYSIS DUE TO LOCAL ANESTHESIA

- It is due to the introduction of LA solution into the capsule of the parotid gland.
- Paralysis results because of facial nerve paralysis "expressionless face".
- Patient will sense a weakening of a muscle.
- In this situation inferior alveolar nerve block usually not present.
- Reassure the patient that condition is transient.
- Advise the patient to periodically to close the eyelid, to keep the cornea lubricated.

- Contact lenses should be removed if present.
- Condition will last for a few hours and will resolve without residual effect.
- Patient should be calm and cool. There should be no fear or anxiety otherwise it may cause palpitation, etc.

TOXICITY DUE TO OVERDOSE OF LOCAL ANESTHESIA

- Usually early CNS stimulation followed by depression.
- Early recognition and early treatment is important.
- In case of mild stimulation patient requires no treatment. Discontinue further administration of LA.
- In case of moderate stimulation:
 - I. Intravenous pentobarbital sodium (Nembutal) or IV secobarbital till patient is calmed.
 - II. Oxygen administration (inhalation).
- In case of convulsions:
 - I. Intravenous succinylcholine 20 to 40 mg—to control convulsion.
 - II. Adequate ventilation.
- In case of CNS depression:
 - I. Support respiration with artificial ventilation.
 - II. Maintaining adequate cardiovascular system through positional changes and use of vasopressure.

ALLERGIC REACTION DUE TO LOCAL ANESTHESIA

- Most dramatic and acutely life-threatening situation can develop within 5 to 30 minutes.
- It includes:
 - i. Skin reaction
 - ii. Smooth muscles spasm of GIT and GUT and respiratory smooth muscle

- iii. Respiratory distress
- iv. Cardiovascular collapse.

In Case of Immediate Skin Reaction (Within 60 Minutes)

- Step 1: IM epinephrine (1:1000) 0.3 ml
- Step 2: IM antihistamine (diphenhydramine) 50 mg
- Step 3: Medical consultation
- Step 4: Observe patient for 60 minutes for evidence of recurrence.
- Step 5: Cap diphenhydramine 6 hourly.
- Step 6: Fully evaluate reaction.

In Case of Delayed Skin Reaction (Develop Within 60 Minutes or More)

- Step 1: IM antihistamine (diphenhydramine) 50 mg and
Cap diphenhydramine 6 hourly 3 to 4 days.
- Step 2: Medical consultation.

In Case of Respiratory Reaction

Bronchial Asthma

- Step 1: Terminate dental therapy
- Step 2: Semi-erect patient position
- Step 3: Administer oxygen
- Step 4: IM 1:1000 adrenaline (epinephrine 0.3 ml)
- Step 5: Observe patient for 60 minutes. Prior to discharge
if relapse occur, repeat IM epinephrine (1:1000)
0.3 ml
- Step 6: IM diphenhydramine 50 mg to minimize relapse.
- Step 7: Medical consultation
- Step 8: Cap diphenhydramine 6 hourly.

Laryngeal Edema

- Step 1: Patient should be in supine position
- Step 2: IM or IV epinephrine 0.3 ml
- Step 3: Airway maintenance
- Step 4: Administer oxygen
- Step 5: IM diphenhydramine 50 mg
- Step 6: IM hydrocortisone sodium succinate to reduce edema 100 mg
- Step 7: Cricothyrotomy—in case of emergency only to maintain airway.

In Case of Generalized Anaphylaxis

- Step 1: Patient should be in supine position
- Step 2: Basic life support ABCD
- Step 3: IM or IV epinephrine 0.3 ml
- Step 4: Medical consultation
- Step 5: Monitor vital signs
- Step 6: Additional drug therapy. For example:
 - IM or IV diphenhydramine 50 mg
 - IM or IV corticosteroid 100 mg.

CELLULITIS

Cellulitis is spreading infections of loose connective tissue.

The treatment of cellulitis is as follows:

- Surgical evacuation of whatever little pus is formed. This eliminates the absorption of toxic product.
- Broad-spectrum antibiotic should be immediately started.
- Pus is difficult to determine and localize. Therefore, aspiration may be helpful.
- Analgesic and anti-inflammatory. Supporting drugs vitamin B-complex is prescribed only when presence of pus is diagnosed.

- Serrazine peptidase is also helpful to reduce edema.

ACUTE ALVEOLAR ABSCESS

- A. Acute alveolar abscess involving soft tissue of face:
 - I. Care of local part:
 - a. Clean the area with antiseptic solution.
 - b. Irrigation with hot saline or antiseptic solution and dilute H_2O_2 and normal saline.
 - c. If carious tooth is present—excavate the carious part of the tooth.
 - d. Give clove oil dressing.
 - II. If the tooth is the one which is not favorable for further treatment, tooth should be extracted.
 - III. Medication:
 - a. Antibiotic therapy: Penicillin
 - b. Anti-inflammatory, analgesic, antipyretic.
 - c. Supplementary vitamin B, C, zinc, etc.
- B. Acute alveolar abscess involving soft tissue of the face:
 - I. Nonsurgical management:
 - a. Antibiotic therapy
 - i. High dose of penicillin: AST crystalline penicillin IM 8 lacs unit/6 hourly
 - ii. Anti-inflammatory, analgesic, antipyretic.
 - iii. Cortisone: If other drugs are not effective.

Surgical intervention should be avoided in acute condition.
 - II. Surgical management:
 - a. Drainage of abscess.
 - b. During incision trauma should be avoided to tissues.
 - c. If fluctuation is present than it is incised and drained.
 - d. In case of maxillary region: It can be drained by extraction of upper tooth. Antiseptic

dressing is given. Oral hygiene should be maintained.

- e. Followed by medication: Antibiotic, analgesic, anti-inflammatory, antipyretic (if required) with supporting drugs vitamin B, C, zinc.
- f. In case of extraoral incision and drainage, alternative dressing is required.
- g. In case of symphysis region (canine-to-canine region): Submental incision is required.
- h. In case of body/angle region (premolar to molar region or even distal to molar): Submandibular incision is required.

PERICORONITIS

Management is divided into:

- A. Local care:
 - Syringing of flap is an effective procedure and irrigation with highly diluted hydrogen peroxide.
 - Warm saline gargle and mouthwashes. This is done to remove superficial slough.
- B. Medical treatment:
 - Antibiotic therapy
 - Aerobic: Amoxycillin; Anaerobic: Metronidazole.
 - Analgesic / Anti-inflammatory / Antipyretic.
 - Supplementary drug—vitamin B-complex, vitamin C and zinc.
- C. Surgical treatment:
 - If periodontal abscess is present, then incision and drainage of abscess is done. Drain is inserted and to be removed after 24 hours.
 - As acute condition subsides, definitive treatment is advised. For example:
 - Removal of impacted tooth
 - Excision of pericoronal flap.

OSTEOMYELITIS

In general management of osteomyelitis require:

- A. Medical treatment
- B. Surgical treatment
- C. Antibiotic therapy alone occasionally is successful.

The goal of the management is to:

- I. Attenuate and eradicate proliferating pathological organism
- II. Promote healing
- III. Re-establishing vascular permeability.

The possible maximum treatment modalities are as follows:

- 1. Incision drainage
- 2. Continuous closed catheter irrigation
- 3. Intravenous antibiotic
- 4. Conservative sequestrectomy
- 5. Extraction of teeth
- 6. Sequestrectomy and saucerization
- 7. Hyperbaric oxygen (HBO)
- 8. Decortication
- 9. Resection of jaw
- 10. With or without immediate or delayed bone graft.

Successful treatment is based on the following fundamental:

- 1. Early diagnosis
- 2. Drain of pus
- 3. Bacteriologic culture and sensitivity test
- 4. Appropriate antibiotic therapy
- 5. Adequate pain control
- 6. Supportive therapy
- 7. Surgical debridement
- 8. Reconstruction where indicated.

A. Medical management “conservative”

1. Complete bed rest
2. Supportive therapy
3. Dehydration
4. Blood transfusion
5. Pain control
6. IV antimicrobial agent
7. Postoperative care
8. HBO therapy
9. Special treatment for specific needs.

Recommended antibiotic regime for osteomyelitis of jaws are as follows:

- First choice:
 - Regime I—as empirical therapy penicillin (Penicillin-V) is given:
 - ❖ Aqueous penicillin: 2 million unit IV every 4 hourly
 - ❖ Oxacillin: 1 gram IV every 4 hourly after 48 to 72 hours. Then start to penicillin V orally 500 mg/4 hourly with dicloxacillin 250 mg orally/4 hourly for 2 to 4 week.
 - Regime II:
 - ❖ It is based on culture and sensitivity result
 - ❖ Penicillinase resistant penicillins such as oxacillin, cloxacillin or flucloxacillin may be given.
 - In case of allergy to penicillin, in order of preference:
 - ❖ Clindamycin 300 to 600 mg/orally 6 hourly
 - ❖ Cephalosporin 250 to 500 mg orally every 6 hourly
 - ❖ Erythromycin 2 gram every 6 hourly IV then 500 mg/6 hourly.

- Second choice “clindamycin”: Not used as first choice because it is bacteriostatic and it may cause diarrhea due to pseudomembranous colitis.
- Third choice “Cefazolin or cephalexin”—not used as first choice because:
 - Moderate effective against anaerobes.
 - Broad spectrum may cause superinfection and bacterial resistance.
- Fourth choice “erythromycin”: They cannot be used as first choice as these are bacteriostatic and rapidly develop resistant strains.

Special treatment for specific needs: Anemia, diabetes mellitus, malnutrition need special treatment.

B. Surgical management:

- Surgical intervention done under antibiotic covering. Start 1 to 2 days prior to the procedure.
- Hot moist compresses should be applied to promote localization of infection
- Application of cold is contraindicated.

The steps are as follows:

1. Incision and drainage: Intra-or extraorally
2. Extraction of loose or offending teeth
3. Debridement: Followed by incision and drainage through debridement of affected area. Area irrigated with hydrogen peroxide and saline and remove foreign body, necrotic tissue and small sequestrum should be removed.
4. Decortication: Removal of chronically infected lateral and inferior cortical plate of bone 1 to 2 cm beyond the area of involvement.
5. Continuous or intermittent closed catheter irrigation.
6. Sequestrectomy: Removal of sequestra (avascular dead part)

7. Saucerization: Excision of margin of necrotic bone overlying a focus of osteomyelitis.
8. Trephination or fenestration: It is the creation of bony holes or windows in the overlying cortical bone adjacent to the infectious process for tissue ammonization and decompression of medullary compartment.
9. Resection: In case of extensive disease
10. Immediate and/or delayed reconstruction
11. Postoperative care: Medication/mouthwash/rest/hydration, etc.

OSTEORADIONECROSIS

Management is under two categories:

- A. Nonsurgical (conservative)
- B. Surgical.

Nonsurgical

1. Change in lifestyle. For example, avoid alcohol.
2. Topical treatment:
 - Maintain oral hygiene with mouthwash
 - Bismuth and iodine in paste form on rough area
 - All infected and nonvital teeth should be extracted.
 - Scaling if advisable
 - Fluoride therapy
 - No radiation therapy should be attempted for 7 to 10 days following extraction
 - If teeth in irradiation area with caries are present should be extracted.
3. Systemic antibiotic: Aerobic and anaerobic before and after tooth extraction.
4. Hyperbaric oxygen (HBO):
 - It is probably the most recent advances in the treatment.

- Hundred percent oxygen is given by mask with the patient in a large chamber at 2.4 atmosphere absolute pressure.
- Each dive is 90 minutes in length
- Treatment is given for 5 days per week for 30, 60 or more dives.
- HBO treatment facilities are currently limited in number.

Surgical

1. Ingress of granulation tissue
2. Sequestrectomy
3. Resection:
 - Intraoral resection
 - Extraoral resection

Postoperative care:

1. Protection by antibiotic therapy
2. Good oral hygiene
3. Blood transfusion if there is low Hb percentage
4. Iron supplement and vitamins.

LUDWIG'S ANGINA

Management is divided into:

- A. Nonsurgical (medical/conservative) treatment
- B. Surgical management.

Aims/Objective/Goals of Management

Taken as a life-threatening emergency situation.

1. Early diagnosis of incipient cases
2. Maintenance of patent airway
3. Intense and prolonged antibiotic therapy
4. Extraction of offending teeth (RCT should not be done in patients with Ludwig's angina)

5. Parenteral hydration
6. Early surgical drainage.

Treatment is Based on

Combination of intensive antibiotic therapy compiled with surgical drainage and decompression of the facial spaces.

Key Points

- I. Airway maintenance: This condition is considered to be fatal. Death can occur from asphyxia rather than the infection itself leading to septicemia and shock.
- II. Blind intubation should be avoided.
- III. Nasoendotracheal intubation is more reliable.
- IV. Surgical airway: It may be required in case of severe upper respiratory obstruction.
- V. Avoid sedatives and narcotic agent that may deteriorate respiration.
- VI. Anesthesia: As a general rule it is always better to use local anesthesia.
- VII. Intravenous analgesics can be supplemented to relieve pain.
- VIII. Surgical intervention: It has two aims—
 - a. Remove the cause: Remove offending tooth
 - b. Surgical decompression: Decompression of the space involved.
- IX. In most cases of Ludwig's angina small amount of pus always associated with offending tooth close to its lingual cortex.
- X. Initial stage of Ludwig's angina or those cases which progress to Ludwig's angina are seen to be managed by simple extraction complied with antibiotics.

Medication: Antibiotic Therapy

Antibiotic plays important role in managing Ludwig's angina. Intravenous antibiotic is preferred.

- a. Penicillins are the first-line of antibiotic.
- b. Aqueous penicillin G—Around 2 to 4 millions unit IV 4 to 6 hourly or 500 mg/6 hourly orally.
- c. Ampicillin or amoxycillin 500 mg IV 6 hourly and 8 hourly.

- d. Cloxacillin 500 mg orally 8 hourly.
- e. In case of allergy to penicillin – erythromycin 600 mg/ 6 to 8 hourly.
- f. Gentamycin 80 mg/BD/IM.
- g. Clindamycin IV 300 to 600 mg 8 hourly/orally.
- h. Metronidazole: It is useful in anaerobes. Dose is 400 mg/8 hourly orally, IV 500 mg/100 ml.
- i. Cephalosporin: Closely related to penicillin. If favorable result are not observed after 48 to 72 hours of therapy, antibiotic should be changed after bacterial culture and sensitivity test.

Hydration

Most of the cases of Ludwig's angina are dehydrated because of two reason:

- a. Diminished liquid intake due to pain and discomfort due to dysphagia (difficulty in swallowing)
- b. Due to toxic nature of the condition.

There is usually excessive urination and perspiration which further leads to loss of liquid from body. It requires fluid IV and orally.

Surgical Decompression: Advantages

- a. It reduces pressure of edematous tissue on the airway reducing respiratory embarrassment.
- b. It promotes drainage.
- c. It allows obtaining specimen or sample for culture and sensitive test.
- d. It allows placement of drain.

Incision and Drainage Surgical Intervention

Bilateral/submandibular incision and if required a midline submental incision 1 cm below the inferior border of mandible are sufficient to drain the involved space.

CAVERNOUS SINUS THROMBOSIS

A. Antibiotic therapy:

- The first drug of choice is IV chloramphenicol 1 gm 6 hourly. Particular antibiotic is advised after culture and sensitivity test.
- Suggested treatment consists of multidrug massive antibiotic therapy.
 - Inj. ceftriaxone up to 6 to 8 gm/day
 - Inj. chloramphenicol up to 2 to 4 gm/day
 - Inj. metronidazole 2 gm/day
 - Inj. amikacin 1 to 1.5 gm/day
- Penicillin is contraindicated because it cannot cross blood-brain barrier.

B. Heparinization to prevent extension of thrombosis.

Heparin 20,000 unit in 1500 ml of 5 percent dextrose or Dicumarol 200 mg may be given orally for the 1st day 100 mg daily thereafter.

C. Neurosurgical consultation.

D. Mannitol—it reduces edema

E. Role of anticoagulant is controversial. It is to prevent venous thrombosis.

F. Drainage of abscess—if subdural or epidural abscess is present.

ACUTE AND CHRONIC MAXILLARY SINUSITIS

Acute Maxillary Sinusitis

Acute maxillary sinusitis may be suppurative or non-suppurative inflammation of antral mucosa.

Classical antral regime include:

- Bed rest
- Plenty of fluid
- Maintenance of oral hygiene

- Antimicrobials:
 - a. Erythromycin 250 to 500 mg/6 hourly for 5 days
 - b. Amoxycillin 250 to 500 mg/8 hourly for 5 days
- Decongestant—care of nasal congestion. For example, nasal drops or sprays—ephedrine sulfate 0.5 to 1 percent in normal saline/6 hourly.
- Nonsteroidal anti-inflammatory analgesic agent: aspirin, paracetamol, ibuprofen.

Chronic Maxillary Sinusitis

There are some factors to be considered in the management of chronic maxillary sinusitis:

1. The longer the management is deferred the greater is the risk of inflammatory changes in lining membrane.
2. In case the cause is the foreign body such as tooth or root in the sinus, it is necessary to retrieve these foreign bodies prior to considering any other form of management.
3. Presence of antral polyps should be removed.
4. The central air space is gently irrigated.
5. Decongestant: Inhalation or spray.
6. Analgesic to be given:
 - The presence of a chronic pyogenic sinusitis subsequent to an oroantral fistula requires surgical closure of fistula.
 - Preoperatively if polyps are found at operation should be removed.
 - If the antrum is found to be full of pus, it should be irrigated through the fistula with warm normal saline or betadine.
 - If there is chronic maxillary sinusitis “non-suppurative” but no oroantral fistula, all conservative regime and surgical drainage should be considered.

REMOVAL OF ROOT/TOOTH/FOREIGN BODIES FROM MAXILLARY SINUS

Following methods are advisable:

Nonsurgical

1. Unanesthetized patient to blow forcible with the nostrils closed.
2. Suck out with sucker nozzle—to admit a sucker nozzle through the socket.
3. Pair of small curved artery forceps can be used to retrieve the missing fragment under direct vision.
4. Gentle irrigation of the sinus with sterile normal saline may affect delivery.
5. A ribbon gauze mixed with iodine packed in the maxillary sinus then sudden withdraw from the sinus, root fragment may get attached with ribbon and come out with ribbon gauze.

Surgical Approach

1. Through bony socket wall
2. Through Caldwell Luc operation “classical canine fossa approach”.

MANAGEMENT OF OROANTRAL FISTULA

Aims of Treatment

- A. Prevent the escape of fluid and other contents across the communication
- B. Prevent the entry of other mouth contents into the antrum
- C. To protect the sinus from oral microbacteria
- D. To eliminate existing antral pathology.

Treatment of Early Cases

In case of recent oroantral communication and formation of fistula not established:

1. Instrumentation should be avoided.
2. Immediate primary closure is done by a simple reduction of the buccal and palatal socket walls.
3. Antibiotic prophylaxis to prevent sinus infection and control of pre-existing infection of antrum. For example, penicillin V 250 to 500 mg/6 hourly IV or orally.
4. Nasal decongestants: Vasoconstrictors nasal drops and sprays and inhalations. For example, ephedrine nasal drop 0.5 percent every 2 to 3 hours, steam inhalation—help in thinning of pus or mucus secretion and soothing effect.
5. To stop blowing and smoking.
6. Temporary measure which effect satisfactory repair include:
 - a. White head's varnish pack
 - b. Denture plate.

Treatment of Delayed Cases

- A. Within 24 hours:
 - If edges of wound are clean, it should be closed immediately by buccal flaps under LA.
 - Antibiotic therapy
 - Nasal drops and inhalation
 - Analgesic, anti-inflammatory
 - Supplementary (zinc preparation)
- B. More than 24 hours:
 - If fistula soft tissue margins get infected, it is preferable to defer the surgical closure until gingival edges show sound healing
 - Antibiotic, analgesics, anti-inflammatory, nasal decongestants, supplementary drug

- Purulent discharge—sinus should be irrigated with dilute hydrogen peroxide, betadine and normal saline.
- C. More than one month:
 - In these cases the fistulous tract is usually well epithelized, surgical closure is required
 - Surgical closure is required
 - Sinus should be irrigated with dilute hydrogen peroxide and betadine and normal saline.
- D. If defect is more than 5 mm in diameter it requires surgical closure with different flaps:
 - Local flaps
 - I. Buccal flaps
 1. von Rhermann's buccal advancement flap
 2. Sliding flap
 3. Nonrotating flap
 4. Transversal flap
 5. Rotated flap
 6. Labial vestibule bipediced flap
 7. Proctor flap
 - II. Palatal flap
 1. Rotational advancement "Ashley flap"
 2. Straight advancement flap
 3. Hinged flap
 4. Island flap
 5. Bipedicle advancement flap
 - Distant flap
 - I. Tongue flap
 1. Anteriorly based partial thickness dorsal tongue flap
 2. Posteriorly based full thickness lateral tongue flap

II. Graft procedure

1. Bone
2. Alloplastic material.

TRIGEMINAL NEURALGIA

Management is divided into two main categories:

- A. Nonsurgical “medical management”
- B. Surgical management.

Nonsurgical Medical Management

Subdivided into following categories:

1. Physiologic therapy:
 - a. Cryotherapy
 - b. Immobilization
 - c. Transcutaneous electrical nerve stimulation (TENS)
 - d. Deep brain stimulation
 - e. Acupuncture
2. Pharmacologic therapy:
 - a. Local anesthetic:
 - Paraneural block
 - Intravenous IV
 - Orally: Mexiletine (lidocaine like preparation), Tocainide sublingually 400 to 600 mg 1 TDS
 - b. Anti-inflammatory:
 - i. Adrenocorticosteroids:
 - Perineural steroid injection
 - Oral route: Dexamethasone (tapering dose) 20 mg/day 5 days
 - Combined therapy: Dexamethasone + Lidocaine
 - ii. Nonsteroidal anti-inflammatory drug:
 - Tab Aspirin 1200 mg to 2 gm
 - Topical application “Capsaicin”, e.g. Zostrix (0.025% capsaicin), Axsain (0.075% capsaicin) 4 times a day

- iii. Antidepressant agent:
 - Amitriptyline at night
 - Doxepin
 - Oxypropylene (latest drug, minimal side effect)
- iv. Narcotic agent: Inj. morphine sulfate 10 mg SC or IM, 2.5 to 5 mg IV slowly
- v. Anticonvulsant "Antiepileptic":
 - Classic anticonvulsant:
 - Carbamazepine (Tagretol)
 - Phenytoin (Dilantin)
 - Baclofen
 - Other drugs:
 - Benzodiazepines
 - Clonazepam
 - Alprazolam.

Key Points

1. Carbamazepine "Tagretol":
 - Choice of drug: Absorbed slowly
 - Initial dose: 100 mg twice daily
 - Dose range: From 400 to 1200 mg
 - Toxic effect: Nausea/vomiting/drowsiness/convulsion/hyperirritability/unsteadiness/aplastic anemia/ataxia
 - Special note: One of the chief difficulty in the use of this drug is to induce its own metabolism. Therefore, patient receiving carbamazepine a complete blood count with platelet count and liver function test must be done before treatment and after first week.
2. Phenytoin "Dilantin":
 - Oldest nonsedative antiepileptic drug
 - Dose 200 mg twice daily (maximum = 400 to 800 mg)
 - Action: Antiepileptic/general depression of CNS
 - Adverse effect: Ataxia/diplopia/blood dyscrasia/on constant therapy it may cause gingival hyperplasia.

Contd...

Contd...

3. Baclofen:
 - Dose: 50 to 60 mg/day alone
 - Minimum side effect: Nausea/vomiting
 - It should be gradually reduced, should not be discontinued
 - Sudden discontinuation may cause hallucination/seizures.
4. Benzodiazepam: Given in chronic pain as a muscle relaxant.
5. Clonazepam:
 - It is given for control of lancinating trigeminal pain
 - Dose: 1 to 3 mg/day. Less side effect.
6. Alprazolam:
 - It is more recent. Action is more rapid
 - Dose: 1 to 3 mg/day
 - Antisymphathetic agent: Tab clonidine 0.1 to 0.3 mg/day
 - Other pharmacological agent
 - Mephentine
 - Sodium valproate.
7. Behavioral therapy:
 - Psychotherapy
 - Operant conditioning of the patient
 - Relaxation therapies (EMG = Electromyography)
 - Hypnotherapy
 - Exercise therapy
 - Occupational therapy.

Surgical Management

Summarized as follows:

1. Anterior fossa:
 - a. Peripheral injections
 - b. Neurectomy
2. Middle fossa:
 - a. Gasserian ganglion injection
 - b. Compression and decompression technique
 - c. Thermocoagulation
 - d. Trigeminal rhizotomy
3. Posterior fossa:
 - a. Trigeminal rhizotomy

- b. Bulbar trigeminal tractotomy
 - Peripheral injection
 - Absolute alcohol injection—0.5 ml relief for 2 to 4 years.
 - Anesthetic solution—2 to 4%
 - ❖ Novocaine oil: Injected into the nerve trunk
 - ❖ It may cause edema/trismus/fever.
 - Glycerol injection: 1 to 2 ml of anhydrous glycerol is injected at the mandibular or infraorbital foramen.
 - Lidocaine with streptomycin: 2 ml of 2% plain lidocaine and 1 gram streptomycin sulfate can be used.
 - Atropine and propranolol: 0.6 to 0.7 mg of atropine sulfate and 2 ml propranolol diluted in 10 cc distill water IV 7 to 10 days.
 - Neurectomy and nerve avulsion
 - Inferior alveolar nerve intraorally
 - Infraorbital nerve: Intraorally/extraorally
 - Buccinator nerve
 - Lingual nerve.

FACIAL PARALYSIS

The prognosis of the peripheral facial palsy is good when it is of nontraumatic origin.

1. Medical therapy: It consists of heavy doses of steroids.
 - a. Tab betamethasone 0.5 mg
 - 4 times a day for 7 days
 - 3 times a day for 7 days
 - 2 times a day for 7 days
 - 1 daily for 7 days
 - b. Tab multivitamin: Injection vitamin B₁₂
2. Physiotherapy: It is to avoid fibrosis of the involved muscles.

3. Surgical treatment—microsurgical procedure involved are:
 - a. Nerve decompression: Extraorally/intraorally
 - b. Nerve anastomoses.
4. Nerve grafting.
5. Repair of facial drooping: Lifting procedure of the face.
6. Reanimation procedures: For example, masseter, temporalis muscles are connected to angle of the mouth, cheek, etc. then training of the patient is required.
7. Repair of facial paralysis by buccal sulcus support: Help to improve facial appearance.
8. Facial cramps: Helps in producing constant blinking of eyes.

BELL'S PALSY

“Bell’s palsy is facial paralysis caused by neuritis of facial nerve within the facial canal.”

1. In early stages of Bell’s palsy inflammation may get suppressed by using systemic cortisone 1 mg/kg/day with gradual taper of dose. For example, Tab prednisolone 30 mg 1st week, 20 mg 2nd week, 10 mg 3rd week and injection B-complex B₁, B₆, B₁₂ for 5 days.
2. Cornea must be protected from abrasion by applying lubricants or wearing glasses.
3. Surgical decompression of facial canal to reduce edema.
4. Galvanic stimulation of facial muscles.
5. If paralysis is permanent, then it may be necessary to give artificial support by means of prosthetic device or by subcutaneously grafted master or fascia lata slings.
6. Surgical redirection of the accessory nerve into the degenerated 7th cranial nerve tissues.
7. Active and passive myotherapy in acute condition.
8. Plastic surgery in chronic cases.
9. Bed rest.

CYST OF JAW AND ORAL CAVITY

Various operative procedures are used for treatment of various types of cysts which are based on the following principles:

- a. Elimination of cystic lining along with its contents.
- b. Decompression of the intracystic pressure.
- c. Elimination of cystic lining.
- d. Preservation of the teeth.
- e. Preservation of important anatomical structure.
- f. Prevention of recurrence of cyst.

Operative Procedures

1. Enucleation of cyst:
 - a. With primary closure
 - b. With open packing
 - c. With removal of tooth
 - d. With tooth conservation
 - e. Combined with Caldwell Luc operation
 - f. Combined with fixation of the pathologic fracture
 - g. Reconstruction/bone grafting.
2. Marsupialization (decompression):
 - a. Partsch I
 - b. Partsch II combined marsupialization and enucleation.
 - c. Marsupialization by opening into nose and antrum.

Marsupialization (Decompression) Principle

- It refers to creating a surgical window in the wall of the cyst and evacuation of the cystic contents.
- This process decrease the intracystic pressure and promotes drainage of the cyst and bone fill.
- The only portion that is removed, is the piece removed to produce the window.

Modification of Marsupialization

Partsch II or Waldron's method 1941: This is a two stage technique that combines the two standard procedures in which first marsupialization is performed and at a later stage, when the cavity becomes smaller, the procedure of enucleation is performed and the entire tissue is examined histopathologically.

Special note: Greatest disadvantage of marsupialization is patient undergo dressing for long period but advantageous for cases who require reduction of intracystic pressure to protect the adjacent standard anatomical structure.

Cyst Enucleation

- It is a process in which a complete removal of cyst is desired.
- Greatest advantage is that patient is not supposed to undergo dressing for long period.
- Disadvantage is, if any part of the cystic lining is left there is recurrence.
- Principle: Enucleation allows for the cavity to be covered by a mucoperiosteal flap and the space fills with blood clot which will eventually organize and form normal bone.

TUMORS OF JAW AND ORAL CAVITY

Principles of surgical management of jaw tumors.

All excisions of the lesions involving the jaw bone can be described by the following terminology:

1. Enucleation
2. Curettage
3. Marsupialization
4. Recontouring
5. Resection without continuity defect

6. Resection with continuity defect
7. Disarticulation.

The various treatment modalities are as follows for “Ameloblastoma” (Eve’s disease):

1. Curettage
2. Chemical cauterization
3. Electrocauterization
4. En bloc excision
5. Jaw resection
 - a. Hemimandibulectomy
 - b. Hemimaxillectomy
6. With or without reconstruction.

Curettage: Scrape the tumor mass and the pathological tissue from the surrounding bone.

Advantages of curettage are:

1. Simple procedure
 2. It does not induce any residual deformity
 3. Less morbidity
- Disadvantage is chances of recurrence are high.

Enucleation

- Removal of nucleolus of proliferation in toto.
- Indicated in case of intact encapsulated mass.
- Recurrence rate high.

En bloc Resection

- Removal of a portion of the jaw in a single bloc with a wide margin of safely still maintaining jaw bone continuity. The continuity of jaw is maintained.
- Whole of the marrow bone is removed keeping the cortical bone intact.

- This is based on the fact that odontogenic tumors invade marrow space but seldom invade the haversian system in a compact bone.

Chemical Cauterization

- For the reason that invasion of tumor cells occur into the bony trabeculae beyond the clinical and radiographic interpretation.
- The bed of tumor is cauterized with concentrated carbolic acid.
- After thorough curettage small cotton pellets soaked in carbolic acid are applied over the tumor bed followed by irrigation with normal saline.

Electrocauterization

- Electrocauterization alone is not advocated.
- If curettage is planned, it can be combined with electrocauterization.

Disarticulation

- Whenever condylar head is included in the resection of the part of mandible, the procedure is called as hemimandibulectomy with disarticulation.
- Whenever the condylar head is retained for rehabilitation procedure, then the procedure is called hemimandibulectomy without disarticulation.

Partial Resection

Resection of a tumor by removing full thickness portion of the jaw is carried out. From small continuity defect to hemimandibulectomy/maxillectomy.

Total Resection

- Excision of a tumor by removal of the involved bone is carried out.
- Maxillectomy/mandibulectomy procedure can be carried out.

Odontoma

Because of capsule, it provides a clear line of separation. So tumor is easily enucleated.

Nonodontogenic Tumor

Osteoma: Surgical excision is done.

Lipoma: Surgical excision is done.

TEMPOROMANDIBULAR JOINT SURGERY**Possible TMJ Surgery**

1. Condylectomy
2. High condylectomy
3. Condylotomy
4. Eminectomy
5. Meniscectomy
6. Arthroplasty
7. Meniscopectomy
8. Zygomectomy
9. Repositioning of head of the condyle
10. Discectomy
11. Lateral pterygoid myotomy
12. Lateral pterygoid myotomy with discectomy
13. Discoplasty
14. Condyloplasty
15. Arthroscopy
16. Capsulorrhaphy
17. Condylectomy with meniscectomy

18. Anchor's procedure
19. Reconstruction of TMJ articulation structure.

Different Approach (Incision) for TMJ Surgery

1. Preauricular incision "Rowe 1927"
2. Preauricular with modification "Irby"
3. Postauricular approach "Alexander 1975"
4. Postramal approach (Hind approach)
5. Retromandibular (intraoral) approach
6. Risdon's (submandibular) approach
7. Endaural (aural or facial) approach
8. Lempert's endaural 1938 approach
9. Alkayat and Bramley 1978 incision
10. Inverted hockey stick (temporal) incision
11. Bicoronal flap or transcoronal frontal flap incision
12. Blair's incision 1928 modified preauricular "Tessier"
13. Dingman and Moorman's (modification of Lempert's incision)
14. Wakely incision "T-shape incision"
15. Rongettis 1954 incision
16. Martin Dunn's incision (modified preauricular)
17. Modified endaural incision
18. Fred Henny's approach (modified preauricular)
19. Popowich and Crane 1982 (modified basic Alkayat-Bramley incision)
20. Thoma incision 1958 (modification of preauricular incision "angulated vertical incision").

TEMPOROMANDIBULAR JOINT ANKYLOSIS (HYPOMOBILITY)

Surgical Strategy Adapted Depends on the Following

- a. Age of onset of ankylosis
- b. Extent of ankylosis

- c. Ankylosis is unilateral or bilateral
- d. Associated facial deformity.

Aims and Objectives of Surgery

1. Release of ankylosed mass and creation of a gap to mobilize the joint.
2. Creation of a functional joint:
 - To improve patient's nutrition
 - To improve patient's oral hygiene
 - To carry out necessary dental treatment.
3. To reconstruct the joint and restore the vertical height of the ramus.
4. To prevent recurrence.
5. To restore normal facial growth pattern.
6. To improve esthetics and rehabilitate the patient.

Age for surgery: As early as possible, immediately after detection of ankylosis.

Concept of Surgery

1. In children: The separation of condyle from glenoid fossa and interpositioning material are used.
2. In older age: Condylectomy and sectioning of the ramus is preferred.
 - Interpositioning gap arthroplasty is preferred than simple gap arthroplasty.
 - Interpositioning alloplastic materials are used such as: Vitallium, tantalum, gold, silastic.

Different surgical techniques are:

1. In case of false ankylosis "Coronoidectomy"
2. In case of true ankylosis:
 - Condylectomy
 - Meniscectomy

- Arthroplasty:
 - Gap arthroplasty
 - Interpositional
- Costochondral grafting in children with:
 - Temporalis muscle flap
 - Ear cartilage
 - Fascia lata
 - Dermal graft
 - Metatarsal bone
 - Silicon material
 - Metallic fossa
 - Lyophilized dura.

TEMPOROMANDIBULAR JOINT HYPERMOBILITY SUBLUXATION

1. Every effort should be done to keep the patient's jaw at rest.
2. Even short term IMF (10 to 21 days) can be done or advice limited mandibular movement.
3. Minor TMJ hypermobility can be eliminated with an occlusal correction.
4. Muscle relaxant.

Miller and Murphy divided the surgical procedure to correct subluxation as follows:

1. Capsulorrhaphy: Capsule tightening procedure.
2. Creation of a mechanical obstacle.
3. Creation of new muscle balance.
4. Direct restraint of the condyle.

TEMPOROMANDIBULAR JOINT DISLOCATION (LUXATION)

Management is divided into:

- A. Nonsurgical
- B. Surgical

Nonsurgical Treatment

1. In case of acute dislocation:
 - a. Relief of pain and anxiety
 - b. Relocate the condyle by inducing:
 - Downward pressure on the posterior teeth
 - Upward pressure on the chin
 - Accompanied by posterior displacement of the entire mandible
 - It is preferred that the operator stand in front of the patient.
 - However muscle spasm may not allow this, in such circumstances it is necessary to induce sufficient muscle relaxation.
 - This can be accompanied by administration of general anesthesia.
2. In case of recurrent dislocation:
 - a. Physical therapy: Isometric exercise to improve opening and closing pattern.
 - b. Symptomatic treatment: The analgesic/anti-inflammatory drugs to relief pain.
 - c. Occlusal treatment: Correction of occlusal discrepancies.

Surgical Management

Mainly carried out in case of chronic dislocation.

1. Procedure to limit translation:
 - a. Anchoring procedure
 - b. Lateral pterygoid myotomy
2. Eliminating blocking factors in condylar path:
 - a. Discectomy
 - b. Eminectomy

3. Combined procedure to eliminate blocking and limit translation:
 - a. Lateral pterygoid myotomy with discectomy
 - b. Condylotomy
 - c. Condylectomy.

MYOFACIAL PAIN DYSFUNCTION SYNDROME

Nonsurgical Treatment

1. Counseling:
 - To explain the condition
 - Advice soft diet
 - Relief of pain (medicine)
 - Home exercise.
2. Occlusal splint: Anterior platform and complete occlusal coverage splint.
3. Physical therapy:
 - Local application of heat
 - Short wave diathermy
 - Ultrasound
 - Spray stretch technique "Fluoromethane spray"
 - Long acting LA solution Bupivacaine.
4. Therapeutic exercise:
 - Straight opening exercise
 - Suprahyoid exercise
 - Finger and thumb dilation exercise.
5. Injection therapy:
 - Intra-articular corticosteroid injection
 - Injection methylprednisolone acetate 40 mg in 1 ml aqueous suspension.
6. Denervation procedure:
 - Injecting small amount of "Sclerosant" 3 percent sodium tetradecyl sulfate
 - Selective sectioning of the posterior auricular nerves.

7. Medication:

- Nonsteroidal anti-inflammatory
- Analgesic: Ibuprofen 200 to 600 mg TDS
- Muscles relaxant
- Narcotic analgesic: IV morphine 2.5 mg (better to avoid them)
- Antidepressants: Amitryptiline 25 mg at night
- Aspirin 2 tab/4 hourly, 0.3 to 0.6 gm
- Piroxicam 10 to 20 mg, 3 to 4 times a day
- Valium 5 to 10 mg, 2 to 3 times a day.

Surgical Treatment

1. High condylectomy
2. Condylotomy
3. Lateral pterygoid myotomy.

SALIVARY GLAND DISEASE

Sialolithiasis

Sialolithiasis refers to the presence of stone in a salivary gland.

Conservative treatment: Salivary stimulants and massage the gland will help to wash the fine debris and also prevent further stone formation.

Surgical treatment: Transoral sialolithotomy or if it recurs, removal of the gland may be necessary.

SIALADENITIS

- Sialadenitis refers to inflammation of salivary gland.
- Acute sialadenitis (bacterial origin): Any acute inflammation of the salivary gland treatment includes:
 - Medicinal treatment consists of course of antibiotics and analgesics

- If there is no response—the pus should be sent for culture and antibiotic sensitivity. The swab must be taken directly from the orifice rather than the saliva
 - The duct may be dilated to effect better drainage.
- Chronic sialadenitis: Any of the acute salivary gland infections may become chronic.
 - Sialogram may be useful to assess the cause and extent of the damage of the gland.
 - Adequate hydration of the patient is important and the use of sialogogues to increase the salivary flow is advised and produce a washing action which is beneficial.
 - Removal of obstruction.
 - Dilation of the duct.
 - Diagnostic and therapeutic sialography may abate the condition.
 - Sometimes if it recurs surgical removal of the gland may be necessary.
- Sialadenitis of viral origin:
 - The condition usually resolves by itself but if required analgesics are advised.
 - Complete bed rest is recommended.
 - Deafness may develop in children.

SIALADENOSIS OR SIALOSES

- Sialadenosis refers to noninflammatory, non-neoplastic swelling of the salivary gland.
- Treatment of sialadenosis is often unsatisfactory because it is closely related to the control of the underlying cause.
- Pilocarpine recently has been reported to be beneficial in the treatment of bulimic patients with sialadenosis.

SIALORRHEA OR PTYALISM

- It refers to excessive salivation.
- Conservative treatment:
 - Anticholinergic's "atropine"
 - Behavioral modification
 - Physical therapy
- Surgical treatment:
 - Submandibular gland resection
 - Transposition of parotid duct
 - Parotid duct ligation.

SALIVARY GLAND TUMOR/PLEOMORPHIC ADENOMA OF PAROTID GLAND

Factors influencing survival:

1. Histopathologic diagnosis
2. Incidence of lymph node metastasis
3. Pain
4. Facial nerve paralysis
5. Skin involvement
6. Stage
7. Location
8. Incidence of recurrence
9. Distant metastasis
10. Chemotherapeutic sensitivity.

Surgical Procedure

- Parotidectomy: Excision of superficial lobe of parotid gland.
- Approaches:
 - Preauricular
 - Submandibular
 - Combination of the two approaches

- Incisions:
 - Gutierrez incision
 - Y-shaped incision.

SALIVARY FISTULA/PAROTID FISTULA

Treatment

- The gland fistula will close spontaneously in 10 to 14 days as long as its major duct is patent.
- A big salivary fistula formed due to injury to the glandular mass requires opening of the wound and repair of the capsule of the gland.
- In case fistula persists then partial removal of the gland may be required after segregating the injured part with Vicryl sutures.
- Radiation has been suggested as a method of eliminating the source of salivary drainage.
- In case of infection, antibiotic therapy is recommended.
- Atropine in small repeated dosages may allow the fistula to close.

FREY'S SYNDROME

Mainly supportive surgical treatment:

- Tympanic neurectomy
- Subdermal insertion of fascia lata graft
- The rotation of sternocleidomastoid muscle
- Flap over the parotidectomy bed.

Most promising approach:

- Use of glycopyrrrolate prepared as 1 percent roll on lotion
- Treatment is directed towards blocking the abnormal neural pathway.

Suggested treatment include:

- Topical application of scopolamine hydrobromide 3 percent cream.

- Alcohol injection to the ganglion.
- Excision of the affected skin with grafting.

XEROSTOMIA

- It refers to subjective sensation of a dry mouth.
- Treatment:
 - Conservative approach
 - Maintenance of oral hygiene
 - Use of sialogogues (pilocarpine)
 - Modification of medication in elderly patient may help to improve the condition.

PRIMARY ASSESSMENT AND MANAGEMENT OF A PATIENT WITH MAXILLOFACIAL INJURIES

Summary

1. Introduction.
2. Aims and goals of treatment of maxillofacial injuries.
3. For life preservation “ Basic ABCs”.
4. Basic principles in management of patient with maxillofacial injuries:
 - a. Resuscitation and stabilization
 - b. Airway ventilator management
 - c. Bleeding or hemorrhage control
 - d. Consciousness restoration/circulation maintenance.
 After initial steps for life preservation.
5. Neurological examination.
6. Assessment of consciousness level “Glasgow coma scale”.
7. Oral and maxillofacial examination
 - A. Intraoral examination:
 - Soft tissue examination
 - Neurological examination
 - Skeletal examination

- Dental examination
- B. Extraoral examination:
 - Soft tissue examination
 - Neurological examination
 - Skeletal examination
- 8. Imaging for evaluation of maxillofacial injuries.
- 9. Treatment planning in complex maxillofacial trauma.

Introduction

- No fixed protocol can govern the treatment of an injured individual.
- But fundamental principles of treatment should be always be followed:
 - a. Prompt and thorough assessment of injured patient.
 - b. Life-threatening situations should be quickly recognised and treated.
 - c. Acute trauma can involve many specialties, thus specialized consultation is mandatory.

Aims and Goals of Treatment of Maxillofacial Injuries

1. Preservation of life
2. Maintenance of function
3. Restoration of appearance (esthetics).

Basic ABCs to be Followed for Preservation of Life

- A – Airway patency maintenance
- B – Bleeding control
- C – Consciousness restoration, circulation maintenance, otherwise
- D – Death will follow.

Basic Principles in Management of Patients with Maxillofacial Injuries

1. Resuscitation and stabilization:
 - It is critical for surgeon to approach this phase of treatment in an orderly and systemic manner.
 - Injuries to the head and neck frequently involve the airway and major vessels. Therefore, the ABCs of resuscitation must be strictly adhered to the primary phase of assessment and management of the patient with maxillofacial trauma.
2. Airway and ventilator management:
 - Maintenance of airway is dependent on the following:
 - The absence of any anatomical or mechanical barrier
 - The preservation of the laryngeal reflex
 - The existence of adequate pulmonary ventilation
 - The integrity of the respiratory center
 - Airway management can be summarized as follows:
 - Position of the patient should be supine with neck extended
 - Oropharyngeal toilet or clear the airway by digital exploration or by using cotton swab
 - Suction should be used to clear the nose, oral cavity and throat
 - Anterior traction of the tongue using tongue suture
 - Artificial ventilation
 - Endotracheal intubation
 - Cricothyrotomy

- Tracheostomy in extensive maxillofacial injuries.

Indications of tracheostomy:

- ❖ Lack of tongue control
- ❖ Gross retroposition of middle-third of the facial skeleton
- ❖ Edema of pharynx or glottis
- ❖ Uncontrollable oro/nasopharyngeal bleeding
- ❖ Respiratory inadequacy. In tracheostomized patient the airway must be monitored carefully.

3. Bleeding or hemorrhage control:
 - Initial digital compression should be given to control the bleeding
 - Major blood vessels which are cut, should be clamped or ligated.
 - Soft tissue wounds which are deep and extensive should be sutured immediately.
 - Nasal bleeding can be stopped by using ribbon gauze packing soaked in 1:1000 adrenaline
 - In some cases postnasal packing may be necessary and anterior nasal packing can be done.
4. Consciousness restoration/circulation maintenance/ cardiovascular and fluid management:
 - Initial assessment of the patient will reveal whether the loss of consciousness is due to intracranial injuries or because of hemorrhagic or neurogenic shock.
 - If the patient is in state of shock:
 - An immediate venipuncture should be done and blood sample should be taken for cross matching.
 - IV fluid should be started to restore the circulating blood volume.

- As soon as possible blood transfusion should be started.
- All vital parameters like pulse/respiration/BP should be monitored.
- Tetanus antitoxin or toxoid should be given.
- Antibiotic, analgesic, anti-inflammatory by IV route should be given.
- For fast recovery, high calorie protein diet should be given.

Neurological Examination

- To evaluate the level of consciousness.
- To assess the patient's level of consciousness, the AVPU (mnemonic) can be used:
 - A : Alert
 - V : Responds to vocal stimuli
 - P : Responds only to painful stimuli
 - U : Unresponsive
- In the unconscious patient, the first step is to consider a differential diagnosis quickly.
- The most commonly utilized mnemonic is AEIOU – TIPPS
 - A : Alcohol
 - E : Epilepsy
 - I : Insulin
 - O : Opiates
 - U : Urea
 - T : Trauma
 - I : Infection
 - P : Poison
 - P : Psychiatric manifestation
 - S : Shock
- There are six cardinal signs of cervical cord injuries as follows:

1. Flaccid extremities
 2. Diaphragmatic breathing
 3. Ability to flex forearms but not to extend
 4. Facial grimace in response above but not below the clavicles
 5. Hypotension with evidence of hemorrhage
 6. Priapism.
- The sensory loss at various cord levels is as follows:
 1. Two inches behind the tip of the ear — level C2
 2. Top of the shoulder — level C4
 3. Tip of the thumb — level C6
 4. Tip of the middle finger — level C7
 5. Tip of the fifth finger — level C8
 6. At the nipple line — level T4
 7. At the lower sternum — level T6
 8. At the level of umbilicus — level T10
 9. Just below the iliac crest — level L1
 10. Just above the knee cap — level L3
 11. Top of the fifth toe — level S1.

Assessment of Consciousness Level with the Help of Glasgow Coma Scale (In Case of Head Injury)

- [E] — Eye opening
 - 4 — opens eyes spontaneously
 - 3 — opens eyes to voice
 - 2 — opens eyes to pain
 - 1 — no eye opening
- [M] — Motor response
 - 6 — obeys commands
 - 5 — localized to pain
 - 4 — withdraws to pain
 - 3 — abnormal flexor response
 - 2 — abnormal extensor response

- 1 — no response
- [V] — Verbal response
 - 5 — appropriate and oriented
 - 4 — confused conversation
 - 3 — in appropriate words
 - 2 — in comprehensible sounds
 - 1 — no sounds
- Coma score = E + M + V
- Minimum = 3
- Maximum = 15

Oral and Maxillofacial Examination

- The surgeon should seek information relating to the patient's medical history.
- A mnemonic that is helpful in the immediate assessment of the patient is ample.
 - A : Allergies
 - M : Medications the patient may be taking
 - P : Past illness
 - L : Last meal
 - E : Events preceding the injury
- One approach organizes the examination from “inside out and bottom up” according to the following systems.
- The oral examination proceeds in following order:
 - Soft tissue
 - Nerves
 - Skeleton
 - Dentition.
- The maxillofacial examination proceeds in the following order:
 - Soft tissues
 - Nerves
 - Skeleton.

- Examination of oral cavity should only be started once the patient has been stabilized and the airway secured.
 - a. Soft tissue examination: Special attention should be given to tongue laceration, attached gingival, palatal mucosa, hard and soft palate.
 - b. Neurological examination—nerve commonly injured:
 - Inferior alveolar nerve — cause lip sensation
 - Lingual nerve — cause alteration in taste
 - c. Skeletal examination: Mandible, subcondylar, TMJ, maxilla, etc.
 - d. Dental examination: Teeth, occlusal relationship.
- Extraoral examination
 - a. Soft tissue examination: Lacerated wound should be examined and closed.
 - b. Neurological examination—it should emphasize on the following nerves:
 - Facial nerve: Injured as a result of facial laceration or penetrating wound.
 - Infraorbital nerve: Injured as a result of the infraorbital rim, ZMC fracture, LeFort II fracture, orbital blow out injury can involve infraorbital fissure.
 - Olfactory nerve: Injured as a result of midface fractures that involve the cribriform plate, anosmia resulting from transection of the olfactory nerve.
 - Oculomotor nerve: Most frequently injured because of intracranial nerve compression resulting from increasing intracranial pressure.
 - ❖ The presence of a dilated pupil indicating cranial nerve III dysfunction should be interpreted as being reflective of a central versus peripheral (orbital) abnormality and require urgent assessment.

- ❖ The surgeon must remember *Anisocoria* can be a normal finding, however serious intracranial injuries and increasing intracranial pressure must be ruled out before one assume that a dilated pupil is a normal finding in the trauma patient.
- Abducens nerve: The patient will exhibit lateral rectus muscle dysfunction on lateral gaze.
- Optic nerve: Can be injured either centrally or within the orbit. It may also be injured as a result of fracture surrounding the optic foramen, it result in compression of the nerve. Both optic and oculomotor nerve can be evaluated with the help of consensual light reflex.
- c. Skeletal examination:
 - The maxilla and the zygoma may now be assessed. For example, ecchymosis in the maxillary buccal fold and class III open bite malocclusion are indicative of maxillary fracture.
 - Nose, orbital rim, TMJ should be examined.

Imaging for Evaluation of Maxillofacial Injuries

- For mandibular (two dimensional view):
 - OPG/PA view of mandible
 - Towne's view for mandibular condyle
 - Cephalometric radiograph
 - Lateral oblique view of mandible
- For middle third:
 - PNS/submentovertex/PA view of skull
 - CT scan, MRI may also be useful.

Treatment Planning in Complex Maxillofacial Trauma

An example of the treatment sequence to be followed is as follows:

1. Tracheostomy is performed if necessary.
2. Tongue laceration are closed.
3. Archbars and other necessary oral appliance such as palatal splints are given.
4. Open reduction of one or both condylar fracture is done. Very high subcondylar or condylar head fracture may not be amenable to open reduction.
5. Reduction open or closed of the symphysis/para-symphysis/body fracture is done.
6. The LeFort I level injury is reduced.
7. Incisions are made in the brow and FZ fracture site is exposed. Infraorbital (subciliary) incision can be made. LeFort II and III and NOE region can also be opened at this time.
8. Intraoral vestibular incision can be used to explore the zygomatic buttress region.
9. The midface (LeFort II) component is reduced.
10. The zygomatic components can be reduced. Visualization has been provided at three of four fracture sites—Buttress, infraorbital rim, ZF suture. Rarely zygomatic arch is necessary or indicated.
11. The buttress region, FZ fracture site, and if necessary the infraorbital rim can be either wired or preferably bone plated.
12. The floor of the orbit is exposed and if necessary repaired.
13. The NOE (traumatic telecanthus) and nasal bone injuries are reduced.
14. The incisions and lip lacerations are closed.

MANDIBLE FRACTURE

Management can be Discussed under following Headings

1. Objective:
 - To avoid infection
 - Provide immobilization
 - Maintains oral hygiene.
2. Goal:
 - Symmetrical face (normal facial contour)
 - Normal functional activity
 - No secondary surgery for malocclusion.
3. General principles in the treatment of mandibular fracture:
 - The patient's general physical status should be evaluated carefully
 - Diagnosis and treatment of mandibular fracture should be approached methodically not with an "emergency" type mentality
 - Dental injuries should be evaluated and treated with treatment of mandibular fractures
 - Re-establishment of occlusion is the primary goal in the treatment of mandibular fracture
 - In the multiple facial fracture mandibular fracture should be treated first
 - IMF time should vary according to the type, location, number and severity of the mandibular fracture
 - Prophylactic antibiotic should be used for the compound fracture
 - Nutritional need should be closely monitored post-operatively
 - Most mandibular fractures can be treated by closed reduction.

4. Overall treatment is considered in main four headings:

(i) First aid treatment which includes:

- Airway patency “to clear airway”
- Arrest of hemorrhage
- Prevention of shock
- Reduction of pain
- *Morphin should never be given with head injury as it masks the symptoms and arrest respiratory center.*
- Temporary immobilization, e.g. barrel bandage, four tailed bandage.

(ii) Preliminary treatment at hospital which includes:

- General care of the patient
- Attention to prevention and management of shock
- Injection ATS 750 to 1500 unit IM
- Oral fluid to prevent dehydration
- In severe case IV Dextrose or NS 5 percent
- Tracheostomy if necessary
- Clean the wound thoroughly
- Periodontal splint or wiring
- Control of the infection.

(iii) Final or definitive treatment for mandibular fracture:

I. Reduction of fractured fragment in normal anatomical position.

- Reduction is the process of bringing the fractured fragment into alignment.
- Two methods for reduction of fractured segment:

a. Closed method:

- It a procedure by which we bring the fractured fragment into alignment without exposing the fractured bone ends.
- It may be—
 - Closed reduction by manipulation
 - Closed reduction by traction.

b. Open method:

- It a procedure by which we expose the fracture bone ends and bring them into alignment under direct vision
- Fracture site can be exposed either intraorally or extraorally.

Steps for surgical procedure:

- Preoperative consideration
- Preoperative assessment
- Anesthesia: Under general anesthesia (GA), nasal/oral intubation
- Preoperative patient preparation extraoral and intraoral
- Drapping
- Incision:
 - Symphysis region: Submental incision
 - Body and angle: Submandibular
 - Condylar fracture: Preauricular (extraoral), retromolar (intraoral, submandibular)
- Blunt dissection and exposure of the fractured site
- Reduction done with Lion's bone holding forcep.

II. Fixation of fractured fragment in normal anatomical position.

<i>After closed reduction: Indirect skeletal fixation</i>	<i>After open reduction: Direct skeletal fixation</i>
• Direct interdental wiring • Indirect interdental wiring or Ivy loop or Eyelet wiring • Continuous wiring	• Direct wiring or osteosynthesis or transosseous wiring • Bone plating • Intramedullary pinning

Contd...

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- | | |
|-----------------------------------|---------------------------|
| • Arch bars | • Titanium mesh |
| • Cap splint | • Circumferential straps |
| • Gunning type splint | • Bone clamps |
| • Pin fixation | • Bone staples |
| • Essig's wiring | • Bone screws (Lag screw) |
| • Gilmer's wiring | |
| • Risdon wiring | |
| • Col. Stout Multiple loop wiring | |

III. Immobilization of jaw.

- a. Fixation applied to the teeth:
 - Dental wiring—it may be direct or indirect
 - Arch bars
 - Cap splint
- b. Direct fixation of bone:
 - Transosseous wiring
 - Upper border
 - Lower border
 - Circumferential wiring
 - Bone plating
 - External pin fixation
 - Bone clamps
 - Transfixation with Kirschner wire "K- wire"
- c. Period of immobilization:
 - Young adult with fracture of angle who receive early treatment in which tooth is removed from fracture site = 3 weeks
 - If tooth is retained in fracture site = 3 + 1 weeks
 - Fracture at symphysis = 3 + 1 weeks
 - Age 40 years and above = 3 + 2 weeks
 - Children = 3 – 1 weeks

IV. Rehabilitation.

- It may be medical and oral and maxillofacial
- To retrain the patient for normal function.

PRINCIPLES OF TREATMENT OF CONDYLAR FRACTURE

Three main treatment advocated for condylar process fractures:

- A. Conservative:
 - This involves immobilization by IMF.
 - The time duration for this treatment may range from 7 to 10 days as in case of unilateral fracture to 4 weeks or more as in bilateral fracture with anterior open bite.
- B. Functional:
 - The emphasis here is given on active movement.
 - The principle is that the risk of ankylosis can be prevented by active movement.
- C. Surgical: In case of displacement or unfavourable fracture, it requires open reduction and fixation with bone plate or transosseous wiring or lag screw.

Surgical Approach

1. Preauricular approach:
 - Alkayat-Bramley
 - Rowe's extension
 - Obwegeser's modification
 - Hockey stick
2. Retromandibular approach
3. Submandibular approach
4. Bicoronal (bilateral condylar fracture along with frontal bone fracture).

Treatment Protocol for Different Types of Condylar Fracture

1. For children under 10 years of age:
 - This age group is more likely to develop ankylosis due to condylar fracture

- The treatment is completely functional for both unilateral and bilateral condylar fracture
 - IMF may be required for a period of 7 to 10 days in case of extreme pain.
2. Adolescents between 10 to 17 years of age: If malocclusion interferes with the treatment then IMF is indicated for a period of 2 to 3 weeks in such cases.
 3. Unilateral intracapsular fracture in adults:
 - It does not cause much of deformity
 - Thus conservative treatment is considered
 - IMF for a period of 2 to 3 weeks in case of malocclusion.
 4. Bilateral intracapsular fracture in adults:
 - IMF for 3 to 4 weeks
 - Physiotherapy after IMF to prevent any restriction in mouth opening.
 5. Unilateral extracapsular in adult:
 - A low condylar neck fracture is treated by open reduction in case of severe malocclusion caused by the fracture or dislocation
 - No effective treatment is undertaken if the fractured segments are not displaced and there is no disturbance to the occlusion.
 6. Bilateral extracapsular fracture in adults:
 - Such types of fracture result in instability and gross displacement of the mandible
 - IMF alone is not reliable
 - Open reduction of fracture site through it may establish occlusion
 - Open reduction of at least one side to establish the normal height is recommended
 - If bilateral extracapsular fracture is associated with other gross midfacial fracture, open reduction of both the sides should be considered.

MANAGEMENT OF FRACTURES OF EDENTULOUS JAW

Techniques for treatment:

1. Closed reduction with splint fixation.
2. Open reduction (intraoral or extraoral) with transosseous, circumferential wire ligation and transfixation on Kirschner wires.
3. Percutaneous intermedullary pinning.
4. Intraoral open reduction with bone graft and maxillomandibular fixation.
5. External splint fixation appliance.
6. Extraoral open reduction and fixation with malleable mesh.
7. Extraoral open reduction and fixation with bone plating.

MANAGEMENT OF MANDIBULAR FRACTURE IN CHILDREN

Principles of Surgical Management

- Highly osteogenic periosteum of the children result in early healing of a fracture with more extensive remodeling after bony union has occurred.
- This fact explains for the reason of more conservative treatment of the fractures in children.
- Mandibular fracture patterns are affected by the fact that the child's jaws are filled with teeth at various stages of development at different time.
- According to "Hardt - Gottsauner"
 - I. The degree of displacement determines the need for osteosynthesis.
 - II. The teething phase will determine the immobilization techniques and the osteosynthesis to be used.
 - III. The site of the fracture will determine the duration of the immobilization.

1. Management before the age of 2 years:
 - Since teeth are not completely erupted children at this stage of development are treated as though edentulous.
 - According to MacLennan—a Gunning type splint is used for such patients with circummandibular wires.
 - If immobilization of the jaw is necessary, the splint may be fixed to both occlusive surface with circummandibular wires for mandible and wires through the pyriform aperture for maxilla.
2. Treatment between the ages of 2 to 5 years:
 - Once deciduous teeth are present, they may be used for fixation
 - Interdental wiring may be used. Mini-arch bars attached with resin may be used to treat non-displaced fracture again avoiding immobilization of the mandible.
3. Treatment between ages of 6 to 12 years:
 - Stage of mixed dentition exists in children aged 6 to 12 years
 - Primary tooth roots are resorbing
 - At the age of 7 to 11 years, primary molars and incisors can be used to anchor fixation
 - At the age of 9 to 12 years standard IMF with arch bars and eyelet wires can be done
 - Thin and soft stainless steel wire can be used for this purpose
 - Cap splint can also be constructed but the retention tends to be inadequate. Hence, it should be reinforced with circumferential wires
 - Rapid healing capacity decrease the duration of immobilization required
 - Around 2 to 3 weeks of immobilization is adequate, may be longer period 1 to 2 weeks

- Circumferential and circumzygomatic wirings are done in case of widespread caries or loose dentition
 - If open reduction and fixation is required, intraoral approach is advocated
 - Place monocortical screw at lower border of the mandible to avoid damaging the underlying teeth.
4. In case of condylar fracture:
 - In children younger than 5 years, condylar neck is short and thick. Injury to the articular surfaces may cause hemarthrosis and subsequent bony ankylosis
 - Early range of motion is important in preventing this complication
 - In children older than 5 years, neck fracture are common and regarded as relatively self correcting
 - The majority of pediatric patients with condylar fracture may be treated nonoperative or with minimal period of IMF depending on the type of fracture.
 5. Angle and body fracture in children:
 - Frequently greenstick type fracture is seen
 - Splint cannot be used in angle fracture
 - If the fracture is nondisplaced or minimal to moderately displaced closed reduction and IMF usually sufficient
 - If severely displaced fracture is present, open reduction is required with extraoral approach.
 6. Parasymphysis fracture: Open reduction with bone plate fixation at lower border combined with stabilization at the dentition with an arch bar give a reliable bony union of the injury without displacement.

Use of Resorbable Bone Plate for Internal Rigid Fixation

- The goal of internal rigid fixation (IRF) using resorbable plates is a balance between stability of the fracture site and the potential risk of operative exposure of the bone.

- The IMF using resorbable plate for the mandible in children uses smaller gauge resorbable miniplates with monocortical screw which are designed keeping in view the location of mixed dentition and the course of inferior alveolar nerve.

MAXILLA FRACTURE

Midface injury can be divided into four main stages of treatment:

1. First aid and resuscitation
 2. Initial assessment
 3. Definitive treatment
 4. Rehabilitation:
 - General rehabilitation
 - Maxillofacial rehabilitation
- I. First aid and resuscitation:
 - Maintenance of airway patency
 - Control hemorrhage
 - Management of any associated head injury
 - II. Initial assessment:

Depends upon:

 - History
 - Clinical examination
 - Radiographic examination
 - Investigation
 - III. Definitive treatment:
 - Preoperative procedure
 - Operative procedure
 - Immediate postoperative care
 - Postoperative care

Preoperative Procedure

Four main essentials to decide before operative procedure:

1. The type of fixation required

- Internal skeletal fixation
- External skeletal fixation
- 2. The need for open reduction
- 3. Type of IMF required
- 4. The need for tracheostomy.

Operative Procedure

Logical sequence of events according to new well established principles:

1. Tracheostomy
2. Facial laceration
3. Reduction of associated mandibular fracture
4. Occlusion
5. Zygomatic fracture
6. Disimpaction and reduction of maxillae
7. Open reduction
8. Skeletal fixation
9. Temporary intermaxillary fixation
10. Nasal fracture
11. Definitive IMF.

Key Points

1. Forceps used for reduction of maxillae
 - a. Rowe's disimpaction forceps:
 - Small, unpadded end, less angulated end passed along nasal floor.
 - Padded, large and more angulated end passed intraoral cavity and engaged into hard palate, rubber pad is used to protect the palate.
 - b. Other forceps used are:
 - Walsh's nasal forceps
 - Hayton Williams's forcep is also useful.
- Operator should stand behind the patient's head "back side of patient".
- Paired forceps should be used simultaneously

- Skeletal fixation is of two types:
 - a. Internal skeletal fixation or internal wire suspension
 - Frontal
 - ❖ Central: LeFort II and LeFort III
 - ❖ Lateral: LeFort II and LeFort III
 - Circumzygomatic: LeFort II and LeFort III
 - Zygomatic: LeFort I
 - Infraorbital: LeFort I
 - Piriform aperture: LeFort I
 - b. External skeletal fixation
 - Plaster of Paris head cap
 - Halo frame
 - Box frame
 - Levant frame.

ZYGOMATIC COMPLEX FRACTURE

Goal/Aims/Objective of Treatment

- a. To restore the normal contour of the face for cosmetic reasons.
- b. To re-establish the skeletal protection for the globe of the eye.
- c. To correct diplopia.
- d. To remove any interference with the range of movement of mandible.

Principles of Treatment of Zygomatic Complex Fracture

1. Prophylactic antibiotics
2. Anesthesia
3. Clinical examination and forced duction test
4. Protection of the globe
5. Antiseptic preparation
6. Reduction of the fracture
7. Assessment of reduction

8. Orbital floor exploration and reconstruction
9. Determination of necessity for fixation
10. Application of fixation device
11. Assessment of ocular mobility
12. Protection of fracture
13. Postsurgical ocular examination
14. Postsurgical radiographs.

Definite Treatment of Zygomatic Complex Fracture

- A. Reduction of fractured fragment in normal anatomical position.
- B. Fixation of fractured fragment in normal anatomical position (if required). Many zygomatic complex fractures become stable after reduction without fixation.

Different Incisions for Exposure of Zygomatic Complex and Arch Fracture

1. Periorbital incisions:
 - a. Supraorbital eyebrow incision—to expose supra and lateral orbital rim
 - b. Lower lid or blepheroplasty incision—to expose infraorbital orbital rim and orbital floor
 - c. Infraorbital incision—standard incision to expose zygoma
 - d. Subtarsal incision
 - e. Subciliary incision (infraciliary incision)
 - f. Transconjunctival incision (TCI)—
 - Retroseptal TCI
 - Preseptal TCI.
2. Alkayat and Bramley incision (modified preauricular incision): For exposure of zygomatic arch.
3. Coronal incision “Bifrontal flap”.

Reduction Techniques

1. Extraoral Gillies temporal approach: For reduction of both zygomatic complex including zygomatic arch fracture.
2. Intraoral buccal sulcus approach also known as Keen technique: Use Freer elevator.
3. Quinn intraoral lateral coronoid approach: For zygomatic arch.
4. Eyebrow approach with Dingman zygomatic elevator.
5. Percutaneous technique by bone hook.
6. Intraoral intra-sinus approach.

Fixation Technique

1. Internal fixation by bone plate.
2. Internal fixation by wire—osteosynthesis:
 - Zygomatic wire fixation
 - Infraorbital wire fixation
 - Zygomatic temporal wire fixation
 - Zygomatic maxillary wire fixation.
3. Internal fixation by K-wire:
 - Transfacial K-wire
 - Transnasal K-wire
 - Oblique K-wire.
4. Extraoral fixation: Pin fixation.

ORBITAL FRACTURE

Key Points

1. The orbital fracture can occur as isolated orbital floor fracture. It can be either blow out or blow in fracture. In combination with other fractures of zygomatic complex, LeFort fracture, etc.

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2. The surgical objectives are:
 - Repositioning of displaced orbital tissue.
 - Reduction of the fracture
 - Stabilization of the fragments
 - Restoration of the orbito-antral partition
 - Elimination of interface with ocular movements
 - Preservation of orbital volume and periorbital fat.
3. Treatment consists of:
 - Surgical exploration of orbital floor
 - Reconstruction of the orbital floor by silastic sheet or bone graft whenever necessary. Otherwise balloon support or ribbon gauze packing can be used in maxillary sinus which is soaked in solution of white head's varnish.
4. Exposure of the orbital floor—may be gained by the following approach:
 - Transconjunctival
 - Infraorbital: Subciliary, subpalpebral.
5. Surgical procedure should be delayed for a minimum of 10 days to permit the edema to subside so that the site of fracture can be studied more appropriately.
6. Indications for surgical intervention:
 - Diplopia which persists for more than 10 days after injury
 - Fracture with excessive amount of orbital tissue herniation into maxillary antrum
 - Enophthalmus which is greater than 3 mm.
7. Caldwell Luc approach is recommended to determine the exact extent of the injury by direct inspection of the maxillary sinus.
 - When the fracture is very mild and is attached to periosteum, simple digital pressure can be applied to reposition it
 - An antral pack is given when:
 - When the defect is not more than 5 mm
 - There is no actual bone loss
 - Any prolapsed tissue can be replaced.
8. Reconstruction of the orbital floor using implants or grafts:
 - Most orbital floor defects can be repaired with autogenous grafts or synthetic implant composed of porous polyethylene, silicone, metallic rigid miniplates, Vicryl mesh or metallic mesh
 - Alternatively, autogenous bone can be used, e.g. maxillary wall or the calvarium.

NASAL FRACTURE

Key Points

1. Incidence of nasal fracture is quite high because of the prominent position of the nose.
2. Reduction and immobilization are the two basic steps in management.
3. Reduction:
 - It may be performed using an open or closed technique
 - The best time for reduction may be within the first 3 hours following injury
 - Otherwise most believe that waiting for 3 to 7 days will resolve the edema and helps in positioning of the bones correctly with more stability
 - Closed reduction in case of minimum displacement
 - Open reduction in case of extensive fracture, deviation of the nasal pyramid, open septal fracture, persistent deformity after closed reduction
 - Many of nasal fracture do not require treatment when the fragments are not displaced
4. Methods of immobilization:
 - Splinting may be required for immobilization.
 - Some undisplaced or simple fracture do not require splinting.
 - Intranasal splinting:
 - Ribbon gauze
 - Stainless splint
 - Extranasal splinting:
 - Plaster of Paris
 - Lead splint.

NASO-ETHMOIDAL-ORBITAL FRACTURE

Key Points

1. The objective of definitive surgical treatment of naso-ethmoidal-orbital (NEO) fracture are:
 - Reduction

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- Fixation of unstable structure segment to stable structure.
- 2. The aims/goals of surgery:
 - To restore proper anatomic relationship
 - To restore the functional and esthetic baseline of the patient
 - Goal of surgery is to restore the anatomic position of the medial canthal ligament (MCT) and the bony segment to which it is attached
 - This prevents later complications related to lower lid laxity, epiphora, esthetic distortion.
- 3. Different incision to access the NEO complex:
 - Medial canthal incision
 - Bicoronal incision
 - Lower subciliary blepharoplasty incision
 - Lower lid transconjunctival incision
 - Medial conjunctival incision through or around the caruncle
 - Subciliary incisions are useful adjunct to the coronal approach in allowing access to the inferior orbital rim
 - The transcaruncular approach involves incision through the caruncle to gain access to the Müller muscle and then to the medial orbital wall
 - The paracaruncular approach involves using an incision through the superomedial and inferomedial borders of caruncle
 - This approach is advantageous because it allows access to the tissue plane between the caruncle and surrounding tissue resulting in reduced bleeding and postoperative edema.
- 4. Type I fracture:
 - Simplest form—isolated involving only the portion of the medial orbital rim
 - Perform reduction by hand or with a penetrating Towel clamp or bone grasping instrument. The reduction must be held in place until fixation is complete.
- 5. Type II fracture:
 - These fractures are complete. It may be single segment or comminuted
 - Additional exposure of the contralateral medial orbital wall is required for fixation
 - Transnasal wiring provides stable source of fixation
 - If feasible in addition to transnasal stabilization, microplated may be used to fix the medial canthus ligament bony fragment to adjacent stable bone

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6. Type III fracture:

- Comminution within the central fragment allows fracture to extend beneath the central insertion are characteristic of the type III fracture pattern
- Both medial orbital walls and bilateral intercanthal tendon fixation is performed
- A monocortical calvarial bone graft may be used to restore bony continuity and provide anchorage for the MCL wire fixation
- Cantilevered Y plates can be used to reposition displaced MCL.

PREPROSTHETIC SURGERY

I. Aims of surgery:

- To eliminate disease.
- To conserve the oral structure whenever possible.
- To provide the best residual tissues, to withstand masticatory stresses.
- To maintain function.
- To retain esthetics for the denture patient.

II. Principal objectives of treatment of preprosthetic surgery. Specific goals are:

- Provide a broad, convex ridge form in the maxilla and mandible.
- Provide fixed tissue over the primary denture support area (residual alveolar ridge).
- Provide facial and lingual vestibules for denture flange extensions.
- Provide ideal interridge relationship.
- In severe bone deficiency, mandible provide bone bulk for strength.
- Protection of neurovascular bundles in bony dehiscence mandibular canals.
- Provide an arched palatal vault form.
- Provide posterior tuberosity notching.

III. Possible preprosthetic surgical procedure:

- Augmentations

- Onlay
 - ❖ Free submucosal graft
 - ❖ Autogenic bone
 - ❖ Allogenic bone
 - ❖ Alloplasts
 - ❖ Any combination of above.
- Interpositional
 - ❖ Autogenic bone
 - ❖ Allogenic bone
 - ❖ Alloplasts
 - a. Tricalcium phosphate (TCP)
 - b. Nonresorbable hydroxyapatite
 - ❖ Any combination of above.
- Vestibuloplasties
 - With soft tissue grafts
 - With pedicled mucografts
 - a. Submucous vestibuloplasty
 - b. Crestally pedicled mucosal grafting
 - Secondary epithelization
 - a. Kazanjian technique
 - b. Clark's technique
 - Mouth floor lowering with mylohyoid and portion of genioglossus muscle repositioning
 - Mylohyoid repositioning
 - Creation of post-tuberosity notch
 - Any combination of above.
- Implants:
 - Osseointegrated implant (screw, basket, blade)
 - Ramus frame implant
 - Subperiosteal implant
 - Staple implant
 - Mucosal inserts.
- Any combination of augmentation, vestibuloplasties and implants.

PRECANCEROUS LESIONS

Oral Submucous Fibrosis

This disorder is being treated by various methods:

1. Restriction of the habits.
2. Local injection of fibrinolytic agent.
 - a. Collagenase
 - b. Trypsin
 - c. Hyaluronidase
 - d. Fibrinolysin
3. Corticosteroid (local/systemic).
4. High dose of vitamin A and E.
5. Injection of large doses of iodides.
6. Local therapy of placenta extract.
7. Surgical splinting of fibrous band.
8. Use of microwave: Diathermy (MWD)
9. Combination therapy:
 - a. Along with restricting the patient's habit—
 - 5-fluorouracil topical application twice daily for 30 days
 - Placenta extract: Its action is essential Biogenic stimulation. It is also proved to increase the vascularity of tissue.
 - b. Iodine compound, B-complex preparation: It is responsible for the stimulation of metabolic process and enzymatic process within the body.
10. Surgical modalities:
 - a. Excision of fibrous bands followed by twice weekly injection of dexamethasone 2 ml (8 mg) for 4 weeks
 - b. Placental graft
 - c. Skin graft
 - d. Buccal fat pad
 - e. Splinting of temporalis tendon

- f. Coronoidectomy
- g. Lingual pedicle flaps.
- 11. Steroids prevent the inflammatory reaction: Therapy prevents the fibrosis by decreasing fibroblastic proliferation and deposition of collagen.
- 12. Hyaluronidase: It helps in breaking of hyaluronic acid. It lowers the viscosity of intercellular cement substance. Decrease the collagen formation.
- 13. Successful regime for oral submucous fibrosis (OSMF):
 - a. Dexamethasone 4 mg
 - b. Hyaluronidase 1500 unit IU
 - c. Chymotrypsin 5000 IU
 - d. Placental extract 2 ml
- 14. Combination:
 - a. Dexamethasone + Hyalase
 - b. Chymotrypsin + Dexamethasone
 - c. Hyalase + Chymotrypsin + Dexamethasone.

Leukoplakia

The general principles of management of leukoplakia are:

1. Removal of offending agent like stop use of tobacco, alcohol, etc.
2. Chemoprevention
3. Surgical management:
 - Usually excised surgically (knife, electrocautery)
 - With the use of a carbon dioxide laser.

ORAL CANCER

Treatment Modalities for Oral Cancer

1. Surgical excision
2. Radiation therapy
3. Chemotherapy
4. Cryotherapy

5. Laser excision
6. Immunotherapy.

Choice of Treatment Depends on

1. Site and extent of primary tumor.
2. The likelihood of complete surgical excision.
3. The possibility of preservation of speech and/or swallowing mechanism.
4. Presence of bone and/or muscle involvement.
5. Presence of metastatic nodal disease.
6. Gross tumor characteristic.
7. Age and physical condition of the patient.
8. Social status and occupation of the patient.
9. Experience and skill of both the surgeon and radiotherapist.
10. At present cryotherapy and lesser excision is used preliminary for superficial and accessible tumor. Both chemotherapy and immunotherapy are used as adjuncts to surgical and radiation therapy.

Surgical Management Involved

1. Excision of small localized superficial lesions using electrocautery followed by primary closure.
2. Wide excision in case of involvement of underlying muscle and connective tissue followed by skin grafting.
3. Partial or total glossectomy in case of wide involvement of tongue.
4. Marginal, segmental or complete resection of mandible in case where neoplasm extend into periosteum and bone.
5. Regional lymph node dissection of neck: Radial neck dissection or Commando operation.
 - Radial neck dissection (RND) includes removal of all cervical lymphatics and lymph nodes from level

- I to V sacrificing the spinal accessory nerves, the sternocleidomastoid muscle and internal jugular vein.
- Modified radical neck dissection (MRND) involves the removal of all cervical lymphatics and lymph nodes from I to V levels along with one or more of the nonlymphatic structure mentioned below
 - ❖ The spinal accessory nerve (SAN)
 - ❖ The internal jugular vein (IJV)
 - ❖ The sternocleidomastoid muscle (SCM)
 - The selective neck dissection (SND) refers to a cervical lymphadenectomy in which there is preservation of one or more lymph node groups that are routinely removed in a MRND along with preservation of the SAN, IJV and SCM. The lymph node groups removed depend upon the patterns of metastasis related to the primary site of the tumor.
 - Extended neck dissection (END) is when lymph node group or nonlymphatic structure other than the ones removed in RND need to be removed. For example, ECA, Level VI lymph node, etc.

Adjuvant Treatment

- Stage III and stage IV cancers need adjunct treatment with radiotherapy.
- Current standards of care dictated that the patient with high risk tumors with stage III and stage IV need to be treated with radiotherapy and chemotherapy.

Treatment Modalities

1. Curettage: Curette or scrape the pathological tissue.
2. Enucleation: Removal of nucleus.
3. Local excision: Removal of pathological tissue along with the removal of some uninvolved bone within 1 cm.

4. En bloc resection: This includes the removal of a portion of the jaw in a single block maintaining jaw bone continuity. Hence whole of the marrow is removed keeping the cortical bone intact.
5. Jaw resection: Removal of part of the jaw which is near to half or more of the jaw. For example, hemimandibulectomy or maxillectomy.

CLEFT LIP AND PALATE

- The goals of the entire treatment plan are:
 1. Increased survival rate
 2. Improved overall function
 3. Improved esthetics
 4. Better social acceptance
 5. Social integration
- Aims and objectives:
 1. To correct the birth defect surgically so that patient can have acceptable facial aesthetics.
 2. To permit intelligible speech
 3. To correct the dentition to allow normal function and esthetics.
- General management protocol for cleft patient:
 1. Immediately after the birth with pediatric consultation feeding instructions to be given.
 2. Within first few weeks of life, team evaluation is done including hearing test is done.
 3. At 10 to 12 weeks surgical repair of lip is done.
 4. Before 1 year of age to 18 months, team evaluation and surgical repair of cleft palate and placement of pressure equalization tubes.
 5. Three months after palate repair, team evaluation for speech and language assessment.
 6. At three to six years, team evaluation and medical behavioral intervention as needed.

7. At five to six years, lip/nose revision is done, if necessary pharyngeal surgery is done.
 8. At seven years, phase I of orthodontic treatment starts.
 9. At 9 to 11 years, prealveolar bone grafting is done.
 10. Twelve year or later, phase II of orthodontic treatment starts.
 11. At 15 to 18 years, end of orthodontic treatment and placement of implant or fixed bridge for missing teeth.
 12. At 18 to 20 years, when most of the growth is completed, surgical advancement is done if required.
 13. Final lip and nose revision, rhinoplasty between 16 to 18 years.
- Timing of lip surgery:
 - The timing of lip surgery varies from 48 hours to 6 months of age, depending on surgeon's judgment.
 - Most surgeons follows "Millards rule of 10" which is 10 weeks of age, 10 gm of Hb, 10 pounds of weight.
 - Repair of cleft lip:
 1. Two most popular methods are:
 - Millards rotation advancement principle
 - The triangular flap repair of Tennission and Balakrishnan.
 2. Principles and objectives of the surgical correction:
 - i. Prolabium should be used to form the full vertical length of the midline of the lip.
 - ii. Vermilion ridge or white line of the inferior border of the prolabium should be preserved.
 - iii. The thin prolabial vermilion border is turned down for lining.
 - iv. The thin central prolabial vermilion is immediately build up with the vermilion muscle flap from the lateral lip segment.

- v. Vermilion ridge should come from the lateral lip segment.
- vi. Upper buccal sulcus should be adequate and no stage should the central portion of the lip hook adherent and tethered to the alveolus.
- vii. No lateral lip skin should be used below the prolabium.
- viii. Lengthen the short columella.
- ix. Premeditated adequate columella planning will avoid the need for later lip re-entry.
- x. The creation of continuity of the prolabium with lateral lip elements joining mucosa for sulcus extension for muscles function.
- xi. Early and permanent alar base positioning.
- xii. Correct disparity between premaxillary and maxillary segments of the alveolar arch.
- xiii. Repositioning of the severely protruding premaxilla must be done to avoid undue push on the lip.
- xiv. Prevention of collapse of maxillary processes behind the premaxilla.
- xv. Orthodontic treatment.
- xvi. Bone grafting to stabilize the premaxilla.
- Repair of cleft palate:
 1. Two methods used are:
 - von Langenback technique
 - Veau-Wardill-Kilner palatoplasty
 2. Treatment guidelines for repair of cleft palate:
 - i. Proper preoperative evaluation is desired.
 - ii. Timing of surgery must be related to the assets and deficits of an individual case.
 - iii. The same surgical procedure can yield different result.

- iv. The surgeon does not always have complete control of the rehabilitative outcome.
- v. Velopharyngeal capability is related to the pharyngeal architecture and to the size and activity of the velum rather than to the cleft type.

CARDIOPULMONARY RESUSCITATION

Introduction

- Management of cardiopulmonary resuscitation (CPR) depends on whether the arrest has occurred in hospital or outside the hospital.
- If it has occurred outside the hospital, then follow Basic Life Support (BLS).
- If it has occurred inside the hospital, then follow BLS plus advanced care life support (ACLS) and post-resuscitation life support, in short it is called as Cardiac Pulmonary Cerebral Resuscitation (CPCR).
- BLS:
 - A : Airway
 - B : Breathing
 - C : Circulation.

Airway Maintenance

- Triple movement:
 1. Open the mouth and clear the airway
 2. Head tilt and chin lift
 3. Jaw thrust
- Foreign body airway obstruction:
 1. Back blows: It should be given on the middle of the back of patient (4 times). This produce the cough impulse.
 2. Hemlich maneuver: It consists of manual thrust with the patient breathing, rescuer behind the patient and compressing patient's chest 6 to 10 times.

3. Finger sweep method: For unconscious patient with foreign body, this can be used both in adults and children.
4. Breathing—one must first determine the presence or absence of breathing by:
 - Placing the ear near the victim's mouth or nose
 - Looking for chest wall movement
 - Auscultation of chest for breath sounds
5. Expired air resuscitation:
 - Mouth-to-mouth breathing
 - Mouth-to-nose breathing
 - Mouth-to-airway breathing.

Circulation Check

- The carotid artery is the most easily palpable.
- The carotid pulse are felt while all other pulse may not be palpable.
- If no pulse is palpable one should start external cardiac compression to establish circulation.

External Cardiac Compression

Key Points

- Position the victim in a supine position on firm surface.
- Locate the lower margin of the victim's rib cage.
- Locate the lower part of the sternum where the rib meets the sternum in the center of the chest wall.
- Keep the force of compression on the sternum.
- The fingers are kept interlocked at the chest.
- Thrust of each compression is straight down on the sternum.
- For the normal sized adult the sternum should be compressed approximately $\frac{1}{2}$ to $1\frac{1}{2}$ inches by the force provided by the rescuer's body weight.
- Optimal sterna compression is the one which can generate adequate carotid pulse.

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- The rescuers should release the pressure after each compression to allow blood to flow into the chest and heart.
- Duration of each compression should be 50 percent of the compression release cycle with a chest compression rate of 80 to 100/minute.

Assessment of the Patient during CPR

1. Inspection:
 - Chest rise
 - Depth of compression
 - Position of rescuer's hand.
2. Palpation:
 - Check for return pulse
 - Assess peripheral pulse
3. Auscultation:
 - Breath sounds
 - Heart sounds.

Standard Approach for Unconscious Patient

- Supine position
- Open the airway and deliver slow air breaths
- Perform 18 compression at the rate of 2 ventilations
- After 5th cycle of compression, re-evaluate the patient
- Check for return of the carotid pulse
- If absent, resume CPR.

Advanced Cardiac Life Support

In addition to BLS, advanced cardiac life support (ACLS) includes assisting ventilation and circulation such as ECG/arrhythmia recognition and defibrillation/establishment of IV access and drug therapy.

Key Points

1. First ABCD of ACLS:
 - A – Airway
 - B – Breathing
 - C – Circulation
 - D – Defibrillation
2. Second ABCD of ACLS:
 - A – Perform endotracheal intubation
 - B – Assist ventilation
 - C – Circulation support, gain IV access, attach monitor, identify rhythm, measure BP, provide appropriate medication.
 - D – Differential diagnosis.

Drug Therapy

Drug therapy is secondary treatment to the more fundamental intervention.

- Adrenaline
 - Atropine
 - Xylocaine
 - Calcium
 - Sodium bicarbonate.
1. Adrenaline:
 - Only vasopressor drug accepted.
 - It is drug of choice even today.
 - Action: Increase peripheral resistance which lead to increase in aortic diastolic pressure causing increase in coronary pressure and myocardial blood flow.
 - Dose: 10 mcg/kg body weight repeated every 5 minute.
 2. Atropine sulfate:
 - Indicated in a systole and when bradycardia co-exists with hypotension.
 - Dose: 0.5 mg IV every 3 to 5 minutes up to total of 0.4 mg/kg. For children, 0.2 mg/kg, minimum of

- 0.1 mg/kg to a maximum of 0.5 mg/kg body weight.
3. Lignocaine or xylocaine:
 - Indications: ventricular tachycardia, ventricular premature contraction
 - Dose: 1 mg/kg body weight followed by 0.5 mg/kg body weight followed by infusion (maximum 3 mg/kg body weight)
 4. Calcium:
 - Indicated in hypocalcemia, hypercalcemia, etc.
 - Dose: 10 mg/kg body weight
 5. Sodium bicarbonate:
 - Indications: Prolonged duration of arrest, metabolic acidosis, hyperkalemia
 - Dose: 1 mg/kg body weight initially, half dose repeated every 10 minutes.
 6. Other drugs:
 - Dopamine: 5 to 10 mcg/kg body weight
 - Dobutamine: 2 to 5 mcg/kg body weight
 - Calcium chloride: 5 to 10 mcg/kg body weight
 - Norepinephrine(vasopressor): 0.1 mcg/kg body weight infusion
 - Nitroglycerine (vasodilators): 0.25 to 0.5 mcg/kg body weight infusion
 - Sodium nitroprusside (vasodilator): 0.25 to 0.5 mcg/body weight.

Complications of CPR

- Rib fracture
- Sternum fracture
- Cardiac laceration or rupture
- Gastric laceration or rupture
- Splenic rupture
- Pneumothorax.

POSTOPERATIVE CARE OF TRACHEOSTOMY PATIENT

Postoperative care of the patient is equally important as the surgical procedure.

Key Points

A. Nursing:

- First 48 hours should carry out the care with sterile precautions.
- Nurse should wear a mask.
- Make sure that the patient has a magic slate on which to write and should have a bell with which to summon assistance.
- The magic slate is the device on which messages may be written and erased by pulling out the plate under the cellophane surface.

B. Fixation of the tracheostomy tube:

- It is essential not to tie the tube too tight and not to tie the knot in the bow.
- If it is tied with tapes the head should first be flexed to relax the neck muscles.
- If tapes are tied with the head extended the tube may become loose on flexion when muscles relax.
- The safest way is to stitch it to the skin with 2-0 silk.

C. Removal of secretions:

- Excess secretions occur after a tracheostomy since the trachea is exposed to cold dry air and the tube acts as a foreign body and stimulates the formation of secretions.
- During the first 48 hours secretions should be removed half hourly and thereafter every 1 to 2 hours.
- The nurse should wear sterile gloves.

D. Humidification:

- This is necessary to prevent crushing of the secretions and is done most simply by instilling normal saline down the tracheostomy tube.
- Before suction in adult 5 ml of normal saline dripped down the tube, suction is then performed and afterwards 5 ml of normal saline are dripped down the tube and left in the tracheobronchial tree.

E. Changing the tube:

- Tracheostomy tube should not be disturbed for the first 48 to 72 hours.

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- But thereafter the tube is changed daily and cleaned at regular intervals.
- On inserting the tube it is essential to check that it is in the trachea and not lying anterior to it in the mediastinum. If this happens respiration will not be heard through the tube and respiratory embarrassment may occur.
- F. Care of the inflatable cuff:
 - When a cuff is blown up to occlude any leaks in the airway, the pressure must be higher than the systolic blood pressure.
 - This means that the area of tracheal wall with which it is in contact is liable to ischemic necrosis.
 - If the cuff is inflated for more than a few hours.
 - It should therefore be let down every half hour when the nurse attends the patient for suction.
- G. Dressings: Waterproof squares are made which protect the surrounding skin from maceration from secretion and the movement of the tube edges.
- H. Removal of the tube:
 - In adult, the tube is removed once the patient can sleep for a night with the tube corked.
 - The wound should then be freshened and sutured to prevent scar formation.
 - In children, it is very much more difficult to remove a tracheostomy tube that has been present for more than a few days.
 - The subglottic region above the trachea acts as a sump and that subglottic edema occurs.
 - This is avoidable by using the tracheostomy tube which is fenestrated and valved. So that when the patient exhales air goes up through the layers thus blowing out any secretion which are stagnating in the subglottis.

EPILEPTIC ATTACK (CONVULSION) DURING DENTAL PROCEDURE

- Convulsion (epilepsy) is brain disorder. Convulsive or involuntary muscle movement called as seizures/fits.
- In case of acute episode:
 - Terminate all dental treatment
 - Remove all instruments from mouth

- Position of the patient – supine position
- Protect the patient from injury
- Remove him/her from any proximity to sharp edges, a fall or trauma
- Loosen the tight collar or other clothing
- To prevent any injury to lips, tongue with the help of a place a well padded tongue blade is kept in between teeth or guaze pad
- If vomiting occurs, head should be turned to the side and permit or suck out
- To establish a patent airway
- Turn the patient on his/her side in the dental chair with head extended and oxygen administration
- Drug therapy:
 - ❖ Injection diazepam 5 mg IV/min up to 10 mg (maximum dose 30 mg in one hour)
 - ❖ For severe episodes: About 20 to 40 mg of succinyl choline chloride IV or double dose IM can be given.

GENERAL CARE OF SURGICAL PATIENT

Introduction

- Proper care of surgical patient can minimize the complications.
- The oral and maxillofacial surgeon should know physical and emotional status of patient.
- For each patient, the surgeon should ask two basic questions:
 - What is the precise nature of the patient's disease?
 - What features of his general condition are likely to influence the course of the surgical procedure?

Preoperative Evaluation

- The general condition of patient may affect the course of surgery adversely.
- These include extremes of age, dehydration and electrolyte imbalance, malnutrition, decreased cardiac reserve, diminished pulmonary reserve, renal insufficiency, hepatic insufficiency, endocrine dysfunction, infection and coagulation defects, etc.

Renal Status

- The clinical manifestations of renal insufficiency are changes in hydration, electrolyte concentration, acid-base balance and calcium phosphorous levels.
- Patients with inadequate renal function represent increased risk of surgical procedure preliminary when GA is required or oral intake affected.
- Patient with occult obstructive uropathy may develop signs of urinary retention postoperatively.
- Patient with chronic infection are prone to develop sepsis. Severe fluid and electrolyte imbalance may be present.
- In general for a patient with renal disease or insufficiency: A random urine analysis for specific gravity, pH, glucose, protein, acetone, occult blood, bacteremia and casts are excellent screening method.
- The specific gravity should be above 1.015 and the pH 6 or less reflecting the ability of the kidney to concentrate urine and excrete acid. Morning specimen should be checked. It should have specific gravity above 1.020.
- Measurement of serum creatinine or blood urea nitrogen (BUN) should be carried out if specific gravity is low or if urine is alkaline or contain protein, blood

cells or casts. It must be evaluated with care. High protein diet, massive erythrocyte destruction or blood in GIT may cause its elevation.

Cardiac Status

- A careful history and physical examination are the most important means for preoperative assessment.
- A past history of rheumatic fever, valvular disease, myocardial or coronary artery disease is strongly suggested by a past or current history of the use of digitalis, diuretics, nitroglycerine or propranolol.
- Complaints of such symptoms are decrease exercise tolerance, progressive shortness of breath, dyspnea on exertion, orthopnea, peripheral edema, chest pain, episodes of syncope or palpitation.
- Above the age of 40 years or suspected patient should go for chest radiographs and ECG.
- Chest X-ray can provide evidence of cardiac enlargement, pulmonary congestion and valvular heart disease.
- ECG can give information of heart rate, rhythm, premature beats, conduction block, arrhythmias, ischemic change pattern, cardiomegaly, myocardial infarction, electrolytes abnormalities or digitalis effect.

Pulmonary Status

- The predominant sign of respiratory insufficiency is dyspnea on exertion.
- History of cigarette smoking, tuberculosis, chronic bronchitis, asthma or emphysema must be noted.
- Cough test can identify patient with chronic bronchitis.
- Routine chest radiographs may show evidence of parenchymal lung disease, emphysema or pulmonary fibrosis.

- Generally the patient with chronic obstructive pulmonary disease (COPD) should be considered a poor risk patient for GA.
- Patient with asthma, bronchitis, chronic restrictive or obstructive pulmonary disease are best managed with LA for outpatient procedures.
- The hospitalized patient with chronic or productive cough but normal pulmonary test should be considered for elective GA in ways that can reduced postoperative complications.
- Preoperatively intermittent positive pressure devices, deep breathing, coughing exercises advisable.
- The use of iodides to gather with adequate hydration will help liquefy tracheobronchial secretions and facilitate their removal.
- Bronchodilators such as aminophylline may cause tachycardia use with caution but theophylline (Elixophyllin) has less cardiac effect.
- Patient with chronic purulent sputum or those with asthma secondary to chronic bronchitis may benefit from preoperative course of antibiotic.
- The patient with asthma may undergo a GA after careful preparation.

SPECIFIC MANAGEMENT PROBLEMS

1. Patient with diabetes:
 - Most well controlled patients with diabetes mellitus present no great management problem.
 - Established odontogenic infection often requires more aggressive care in the diabetes and may also alter glucose tolerance.
 - It is important to know whether onset was juvenile or adult. Whether control is by diet alone, oral hypoglycemic drugs, single dose long-acting insulin or long-acting and short-acting insulin.

- Whether the patient has episodes of hypoglycemia manifested as insulin shock, whether the patient has ever been in diabetic coma, whether the patient undergoes urine tests regularly.
- It is a basic rule that the diabetic on insulin must have carbohydrate to cover the insulin.
- The stress of anesthesia causes glucose intolerance.
- Hypoglycemia is a more hazardous condition than hyperglycemia.
- The patient having single extraction under local anesthesia should be treated soon after meal time preferably in the morning.
- Ambulatory patients undergoing GA are requested not to eat and drink prior to the procedure. They may require the following modifications:
 - If they are taking oral hypoglycemic twice a day, the prior evening dose as well as the morning dose is omitted. They are treated early in the morning.
 - As soon as oral intake is re-established, they should eat and take their morning dose of medication and there after return to their normal regime.
 - Patient taking a single morning dose of long-acting insulin may take half of their dose before procedure even they have not eaten. After the procedure as soon as adequate oral intake is re-established the remaining daily dose of insulin should be taken.
 - For patients taking multiple doses of different types of insulin, consultation with the physician is a must. Hospitalization may be required.
- Hospitalization of the surgical patient with diabetes mellitus requires closer monitoring of blood

- glucose levels and the provision of continuous glucose via IV infusion.
- Surgery should be done early in the day. Intravenous 5 percent or 10 percent glucose in water is administered and half the usual dose of long-acting insulin is given at the time of infusion is begun.
 - On completion of the procedure, the remaining half of the insulin is given, glucose infusion is continued.
 - The urine sugar and ketones are checked every 4 hours.
 - Additional insulin is added for the presence of ketosis.
 - In case of IMF there is marked limitation of oral intake. The sliding scale regime is continued in such cases.
 - In emergency situation again the use of an IV glucose infusion and sliding scale insulin coverage is recommended.
2. Patients taking anticoagulants:
- Systemic anticoagulants is used in a variety of cardiovascular disease.
 - Agents used include aspirin, warfarin sodium and heparin.
 - No adjustment in anticoagulant dose for a simple single extraction is required.
 - Suturing, pressure packs and attention to measures that will protect the clot usually give satisfactory result.
 - The alteration of an anticoagulant regime may become necessary with increase magnitude of surgery.
 - In patients where the risk of decreased anti-coagulation may be significant and where surgery is necessary, hospitalization should be considered. Rapid controlled anticoagulation with heparin or low molecular weight dextran can be used.

3. Patients taking steroids:

- The normal adrenal cortices produce about 20 mg of hydrocortisone daily.
- A patient receiving steroids or who has received steroids for two or more week within the last 6 to 12 months must be considered to have a variable degree of functional adrenocortical suppression.
- These patients will need a source of exogenous glucocorticoid during stressful periods. This prevents "hypoglycemia, hypotension, shock".
- Short term excess of glucocorticoids is relatively harmless, whereas short-term deficiency during stress may be fatal.
- Around 12 hours preoperatively 100 mg of cortisone hemisuccinate is given IM.
- The day of surgery 100 mg of cortisone hemisuccinate is given IM with other preoperative medicines.
- During the procedure 100 mg of cortisone hemisuccinate is given by IV drip.
- Postoperatively cortisone hemisuccinate is given IM 50 mg every 6 hours the first day, 50 mg every 8 hours the second day, 25 mg every 6 hours the third day, 25 mg every 8 hours the fourth day and 12.5 mg every 6 hours the fifth day.
- For patients previously taking daily steroids the tapering dose can be stopped at the equivalent therapeutic level.
- Oral steroid of equivalent dose may be given in a place of injection in patients able to take medication by mouth.
- Patient undergoing limited oral surgery under LA, doubling the daily dose the night before surgery and on the day of surgery combined with 50 mg of cortisone hemisuccinate $\frac{1}{2}$ hour before the procedure is recommended.

- A maintenance regime can be resumed the next day since the amount of steroid given prophylactically is not sufficient to cause withdrawal symptoms.
4. Patients with coronary artery disease:
 - History of myocardial infarction carries an increased morbidity and mortality in patients undergoing GA.
 - If surgery is within 3 weeks of a fresh myocardial infarction. Hundred percent of these patients will extend their infarct and 25 percent will die of their disease.
 - Six months following infarction one would not routinely undertake a full mouth extraction, under GA at 3 months although an extraction for the relief of pain and anxiety could be carried out with proper precautions.
 - In some situation, a patient with moderate angina pectoris requiring a full mouth extraction may be placed under less risk with a well controlled GA than with LA.
 - Electrolytes must be checked prior to GA. Hypokalemia resulting from diuretic action is potentially lethal.
 - Discontinuation of propranolol remains controversial.
 5. Patients susceptible to endocarditis:
 - There is general agreement that such patients should receive prophylactic antibiotic.
 - Basic treatment preferably includes administration of a bactericidal antibiotic.
 - The oral flora may be changed within 48 hours of penicillin prophylaxis, thus it is advisable to start antibiotics on the day of surgery rather than the day before an extraction.

- American Heart Association for prophylaxis has recommended prior to surgery.
- Daily low doses of penicillin for, e.g. 400,000 U/day by mouth are often taken to prevent a recurrence of rheumatic fever but not systemic bacterial endocarditis.
- Increased doses of penicillin have a major place in the prophylactic management who at risk for systemic bacterial endocarditis.
- There is some evidence that staphylococcal endocarditis is more common than streptococcal endocarditis in patients with a prosthetic valve.
- Some cardiologist suggest that patients undergoing oral surgery in addition to penicillin prophylaxis IM oxacillin or oral oxacillin be used. Because of its effectiveness against staphylococci.
- A suitable single drug regime would be erythromycin 500 mg QID the day before surgery, the day of surgery and the day after surgery.
- The American Heart Association recommends that streptomycin used with penicillin for prophylaxis of patients with prosthetic heart valves in place.
- In the allergic patient IV vancomycin is recommended.
- The recommendations vary. Oral surgeon should take opinion with cardiologist.

Chapter

6

Syndromes in Oral and Maxillofacial Region

🔑 Chapter Outline

- Albright's Syndrome
- Aldrich's Syndrome or Wiskott-Aldrich Syndrome
- Aglossia-Adactylia Syndrome
- Anderson Syndrome or Familial Osteodysplasia
- Angio-osteohypertrophy Syndrome
- Apert's Syndrome/Acrocephalosyndactyly
- Ascher's Syndrome
- Blepharo-Naso-Facial Syndrome
- Burning Mouth Syndrome
- Carpenter's Syndrome
- Costen's Syndrome
- Cerebro-Costo-Mandibular Syndrome
- Cracked Tooth Syndrome
- Crouzon's Syndrome or Craniofacial Dysostosis
- Cushing's Syndrome
- Craniomandibular Syndrome or Temporomandibular Joint Dysfunction Syndrome
- Cerebellar Syndrome
- Central Cord Syndrome
- Down's Syndrome or Trisomy of 21 or Mongolism
- Eagle's Syndrome
- Ehlers-Danlos Syndrome or Rubber Man
- Edwards' Syndrome (Trisomy 18 Syndrome)
- Elashy Water's Syndrome or Brachioskeletogenital Syndrome

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- Fanconi's Syndrome
- First Arch Syndrome
- Frey's Syndrome or Auriculotemporal Syndrome
- Fetal Alcohol Syndrome
- Fifth Seventh Cranial Nerve Syndrome or Tic Convulsive
- Gardner's Syndrome
- Goltz-Gorlin Syndrome or Focal Dermal Hypoplasia
- Goldenhar's Syndrome
- Grinspan's Syndrome
- Gorham's Syndrome or Massive Osteolysis or Phantom Bone
- Heerfordt's Syndrome
- Hecht-Beals-Wilson Syndrome
- Horton's Syndrome or Sphenopalatine Neuralgia/Alarm Clock Headache
- Hajdu-Cheney Syndrome
- Jaw Winking Syndrome or Marcus-Gunn Phenomenon
- Jaw Cyst/Basal Cell Nevus/Bifid Rib Syndrome/Gorlin-Goltz Syndrome
- Larsen's Syndrome
- Long Face Syndrome (Vertical Maxillary Excess)
- Marfan's Syndrome
- Moebius Syndrome/Congenital Facial Dysplasia
- Myofascial Pain Dysfunction Syndrome
- Melkersson-Rosenthal Syndrome
- Median Cleft Face Syndrome or Frontonasal Dysplasia
- Mohr's Syndrome
- McCune Albright's Syndrome
- Nagar's Syndrome or Acrofacial Dysostosis
- Orofacial Digital Syndrome
- Oromandibular Limb Hypogenesis Syndrome
- Oto-Palato-Digital Syndrome
- Orbital Syndrome
- Postextraction Syndrome (Osteomyelitis Syndrome or Dry Socket)
- Plummer-Vinson Syndrome
- Pfeiffer's Syndrome
- Raeder's Syndrome or Paratrigeminal Syndrome
- Ramsay Hunt's Syndrome
- Sjögren's Syndrome

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- Superior Orbital Fissure Syndrome
- Styloid Process Syndrome
- Syngnathia-Popliteal Pterygium Syndrome
- Scheuthauer-Marie-Sainton Syndrome/Cleidocranial Dysplasia
- Tricho-Dento-Osseous Syndrome
- Trotter's Syndrome
- Temporomandibular Joint Dysfunction Syndrome
- Treacher Collins Syndrome/Mandibulofacial Dysostosis
- Van der Woude's Syndrome
- Whistling Face Syndrome/Craniocarpalotarsal Dysplasia
- XXXY Syndrome
- Zygomatic Syndrome

ALBRIGHT'S SYNDROME

Characterized by:

- a. Severe fibrous dysplasia involving nearly all bones of the skeleton.
- b. Pigmented lesion of the skin "café au lait" spots.
- c. Endocrine disturbances—hyperfunctioning of one or more endocrine glands.

ALDRICH'S SYNDROME OR WISKOTT-ALDRICH SYNDROME

Characterized by:

- a. Thrombocytopenic purpura
- b. Eczema
- c. Increased susceptibility of infection
- d. Oral features:
 - i. Spontaneous bleeding from gingiva
 - ii. Palatal petechiae.

AGLOSSIA-ADACTYLIA SYNDROME

Characterized by:

- a. Absence of tongue

- b. Absence of finger or toe or limb
- c. Craniofacial malformation.

ANDERSON SYNDROME OR FAMILIAL OSTEODYSPLASIA

Characterized by:

- a. Craniofacial and skeletal anomalies
- b. Presence of diastolic hypertension
- c. Presence of hyperuricemia
- d. Oral features:
 - i. Maxillary hyperplasia
 - ii. Reduced ramus
 - iii. Mandibular prognathism
 - iv. Malocclusion.

ANGIO-OSTEOHYPERTROPHY SYNDROME

Characterized by:

- a. Port wine stains on the face, varices
- b. Hypertrophy of bone including jaw bone
- c. Oral features:
 - i. Facial asymmetry
 - ii. Malocclusion
 - iii. Altered eruption pattern of teeth.

APERT'S SYNDROME/ACROCEPHALOSYNDACTYLY

Characterized by:

- a. Skeletal deformities such as:
 - i. Syndactyly
 - ii. Acrocephaly
 - iii. Ovoid shaped skull
 - iv. Brachycephalic and often presents a horizontal supraorbital groove
- b. Facial deformities—the middle third of the face is undeveloped

- c. Oral features:
 - i. High palatal vault
 - ii. V-shaped maxillary alveolar ridge
 - iii. Posterior palatal cleft
 - iv. Bifid uvula
 - v. Retarded eruption
 - vi. Dental malocclusion.

ASCHEER'S SYNDROME

Characterized by:

- a. Double lip
- b. Blepharochalasis (i.e. drooping of the tissue between the eyebrow and the edges of the upper eyelid)
- c. Nontoxic thyroid enlargement.

BLEPHARO–NASO–FACIAL SYNDROME

Characterized by:

- a. Mental retardation
- b. Joint disorder
- c. Craniofacial anomalies
- d. Facial features:
 - i. Affected individuals show microcephaly
 - ii. Antimongoloid slant of the palpebral fissure
- e. Oral features:
 - i. Hypoplastic maxilla
 - ii. Protruding lip
 - iii. Malocclusion resulting from midface hypoplasia.

BURNING MOUTH SYNDROME

Characterized by:

- a. Pain and burning sensation in the mouth
- b. Altered taste sensation

- c. Xerostomia
- d. No clinically detectable lesions in the oral cavity.

CARPENTER'S SYNDROME

Very rare craniofacial birth defect that is characterized by:

- 1. An underdeveloped jaw
- 2. Additional fingers or toes
- 3. Tower-shaped skull
- 4. Mental deficiency
- 5. Obesity
- 6. Deformed ears
- 7. Highly arched palate
- 8. Widely spaced eyes
- 9. Low set and reduced height.

COSTEN'S SYNDROME

Characterized by:

- a. Impairment of hearing either continuously or intermittently
- b. Stuffiness sensation in the ears, especially at meal time
- c. Tinnitus, otalgia, dizziness and headache about the vertex, occiput and behind the ears
- d. Syndromes in oral and maxillofacial region — burning sensation in the throat, tongue and side of the nose.

CEREBRO-COSTO-MANDIBULAR SYNDROME

Characterized by:

- a. Thoracic deformity with barking cough sound
- b. Mental retardation
- c. Oral features:
 - i. Mandibular micrognathism
 - ii. Palatal defect
 - iii. Absence of uvula or sometimes even soft palate.

CRACKED TOOTH SYNDROME

Characterized by:

- a. Development of crack in a restored or unrestored tooth due to excessive occlusal force
- b. Sharp pain on biting.

CROUZON'S SYNDROME OR CRANIOFACIAL DYSOSTOSIS

Characterized by:

- a. Cranial deformities:
 - i. Protuberant frontal region with an anteroposterior ridge overhanging the frontal eminence and often passing to the roof of nose (triangular frontal defect)
 - ii. Cranium is brachycephalic
- b. Facial malformations such as:
 - i. Hypoplastic maxilla
 - ii. Mandibular prognathism
 - iii. Short upper lip
 - iv. Nose resembles parrot's beak
- c. Oral features:
 - i. High arched palate
 - ii. Peg-shaped teeth
 - iii. V-shaped dental arch
 - iv. Partial anodontia
- d. Eye changes:
 - i. Hypertelorism
 - ii. Exophthalmos
 - iii. Optic neuritis
 - iv. Choked disc frequently resulting in blindness
- e. Others: Spina bifida occulta.

CUSHING'S SYNDROME

Characterized by:

- a. Adiposity about the upper portion of the body

- b. Mooning of the face
- c. Tendency to become round shouldered
- d. Buffalo hump—seen at the base of the neck
- e. There is dusky plethoric appearance with formation or purple striae
- f. Vascular hypertension
- g. Glycosuria and albuminuria
- h. In children:
 - i. Osteoporosis
 - ii. Premature cessation of epiphyseal growth.

CRANIOMANDIBULAR SYNDROME OR TEMPORO-MANDIBULAR JOINT DYSFUNCTION SYNDROME

Characterized by:

- a. Joint between the mandible and cranium.
- b. It is a true synovial joint.
- c. The two articulating complex of both (mandible and maxilla) carry teeth.
- d. It is bilateral articulation with the cranium so the right and left temporomandibular articulation do the muscular function together.
- e. The temporomandibular joint (TMJ) is a complex joint. Each joint has an articular disc (meniscus) situated between the condyle and temporal bone.
- f. There is no hyaline cartilage.
- g. The articular cartilage and the central portion of the disc do not have nerve supply and blood supply.

CEREBELLAR SYNDROME

Characterized by:

- a. Muscular hypotonia
- b. Intention tremors
- c. Nystagmus

- d. Scanning speech
- e. Ataxic gait.

CENTRAL CORD SYNDROME

This syndrome occurs in the setting of forceful hyperextension and backward thrusting of the neck. Usually in an elderly patient with cervical spondylosis and stenosis.

Paralysis occurs in this syndrome without vertebral injury, upper extremities than the lower extremities with arm fibers medial and leg fibers lateral.

DOWN'S SYNDROME OR TRISOMY OF 21 OR MONGOLISM

Characterized by:

Trisomy of chromosome number 21.

- a. V-shaped high vault palate.
- b. Short palate insufficiency.
- c. Angle of the mouth is pulled down due to hypotonic musculature.
- d. Lower lip is everted.
- e. Mouth breathing with drooling of saliva.
- f. Chapped lower lip and angular cheilitis.
- g. Tongue—scalloped or fissured tongue, macroglossia, protrusion with tongue thrusting.
- h. Teeth—microdontia, hypodontia, partial anodontia, supernumerary teeth, spacing, taurodontism, crown variation, agenesis, hypoplasia, hypocalcification, delayed eruption, malocclusion.
- i. TMJ—TMJ dysfunction, bruxism.
- j. Systemic—cardiovascular, musculoskeletal, hematological, nervous system and behavior change.

EAGLE'S SYNDROME

Characterized by:

Elongation of styloid process or ossification of styloid ligament.

Features include:

- a. Dysphagia
- b. Sore throat
- c. Otalgia
- d. Glossodynia
- e. Headache
- f. Vague orofacial pain.

EHLERS-DANLOS SYNDROME OR RUBBER MAN

Characterized by:

- a. Hyperelasticity of skin
- b. Hyperextension of joint
- c. Fragility of skin and blood vessels
- d. Oral features:
 - i. Enamel hypoplasia.
 - ii. Periodontal disturbance is severe.
 - iii. Hypermobility of TMJ resulting in repeated TMJ dislocation.

EDWARDS' SYNDROME (TRISOMY 18 SYNDROME)

Characterized by:

- a. Mental retardation
- b. Hypertonicity
- c. Facial features:
 - i. There are small eyes and prominent occiput.
 - ii. The index finger overlaps the 3rd finger and 5th finger overlaps the 4th finger.
- d. Oral features:
 - i. Micrognathia
 - ii. High arched palate

- iii. Cleft palate
- iv. Bifid uvula.

ELASHY WATER'S SYNDROME OR BRACHIO-SKELETOGENITAL SYNDROME

Characterized by:

- a. Mental retardation
- b. Brachycephalic face
- c. Divergent strabismus
- d. Ocular hypertelorism
- e. Oral features:
 - i. Cleft palate
 - ii. Multiple jaw cysts.

FANCONI'S SYNDROME

Characterized by:

- a. Congenital or familial anemia.
- b. Bone abnormalities—microcephaly
- c. Generalized olive brown pigmentation of the skin.

FIRST ARCH SYNDROME

Characterized by:

- a. Cleft lip and cleft palate
- b. Mandibulofacial dysostosis
- c. Hypertelorism
- d. Deformities of ear.

FREY'S SYNDROME OR AURICULOTEMPORAL SYNDROME

It is caused by damage to the auriculotemporal nerve.

Characterized by:

- a. Flushing and sweating of the involved side of the face.

- b. Chiefly in temporal area during eating.
- c. Gustatory sweating when eating spicy food.

FETAL ALCOHOL SYNDROME

The developmental deformities include:

- a. Microcephaly
- b. Epicanthal fold
- c. Short palpebral fissure
- d. Low nasal bridge
- e. Minor ear anomalies
- f. Flat midface
- g. Short nose
- h. Thin upper lip
- i. Indistinct philtrum
- j. Micrognathia.

FIFTH SEVENTH CRANIAL NERVE SYNDROME OR TIC CONVULSIVE

Sudden paroxysms of each nerve is like electric stimulation.

The motor and sensory paroxysms are ipsilateral but do not occur synchronously.

Characterized by:

- a. Hemifacial spasm.
- b. Spasm progresses to involve all facial muscles.
- c. After many years, the patient develops a mild unilateral facial weakness.

GARDNER'S SYNDROME

Characterized by:

- a. Oral features:
 - i. Hypercementosis
 - ii. Multiple unerupted supernumerary
 - iii. Compound odontoma

- b. Cysts: Multiple epidermoid or sebaceous cysts of the skin particularly of the scalp and back
- c. Tumors:
 - Osteomas of bone including long bones, skull and jaw
 - Lipoma
 - Adenocarcinoma of colon
- d. Systemic features: Multiple polyposis of large intestine and polyp of colon and rectum.

GOLTZ-GORLIN SYNDROME OR FOCAL DERMAL HYPOPLASIA

Characterized by:

- a. Oral features:
 - i. Papilloma of lip
 - ii. Microdontia
 - iii. Cleft lip and palate
- b. General features—focal absence of dermis associated with herniation of subcutaneous fat into the defects
- c. Skin atrophy
- d. Multiple papillomas of skin or mucosa
- e. Streaky pigmentation.

GOLDENHAR'S SYNDROME

Characterized by:

- a. Unilateral microstomia
- b. Mental retardation
- c. Hypoplastic zygomatic arch
- d. Facial features:
 - i. Downward slanting of the palpebral fissures
 - ii. Malformed pinna
 - iii. Iris coloboma
- e. Oral features:
 - i. High arched palate

- ii. Palatal and uvular cleft
- iii. Malocclusion.

GRINSPAN'S SYNDROME

It is a triad of:

- a. Lichen planus
- b. Diabetes mellitus
- c. Vascular hypertension.

GORHAM'S SYNDROME OR MASSIVE OSTEOLYSIS OR PHANTOM BONE

Characterized by:

- a. Osteolysis of single or multiple bones followed by replacement with fibrous tissue
- b. Pain in the bone and pathologic fracture
- c. Oral features—destruction of mandible or maxilla
- d. Pain
- e. Facial asymmetry.

HEERFORDT'S SYNDROME

Characterized by:

- a. Firm, painless, bilateral enlargement of parotid gland
- b. Inflammation of the uveal tract of the eye
- c. Facial palsy.

HECHT-BEALS-WILSON SYNDROME

Characterized by:

- a. Limited mandibular opening
- b. Shortened legs
- c. Hamstring muscle
- d. Club foot.

HORTON'S SYNDROME OR SPHENOPALATINE NEURALGIA/ALARM CLOCK HEADACHE

Characterized by:

- a. Unilateral paroxysms of intense pain in the eye, ear, maxilla, mastoid region, base of the nose and below the zygoma.
- b. Absence of trigger zones and occurrence of pain everyday at the same time. For this reason, it is called as alarm clock headache.

HAJDU-CHENEY SYNDROME

It is a rare autosomal dominant disorder characterized by:

- a. Short stature
- b. Disintegration of terminal phalanges of fingers and toes
- c. Oral feature—premature loss of teeth.
- d. Skeletal features:
 - i. Multiple fractures of bones
 - ii. Sutures are usually open
 - iii. Frontal sinuses are usually absent
- e. Facial features:
 - i. Abnormal shape of skull
 - ii. Long nose
 - iii. Low frontal hairline
 - iv. Flared ears.

JAW WINKING SYNDROME OR MARCUS-GUNN PHENOMENON

Characterized by:

- a. Rapid elevation of ptotic eyelid occurring on movement of the mandible on the contralateral side.
- b. Congenital unilateral ptosis.

JAW CYST/BASAL CELL NEVUS/BIFID RIB SYNDROME/GORLIN-GOLTZ SYNDROME

Characterized by:

- a. Dental abnormalities:
 - i. Odontogenic keratocyst
 - ii. Mild mandibular prognathism
- b. Osseous abnormalities:
 - i. Bifid rib
 - ii. Vertebral anomalies
 - iii. Brachymetacarpalism
- c. Cutaneous anomalies:
 - i. Basal cell carcinoma
 - ii. Dermal cysts and tumors
 - iii. Palmar pitting
 - iv. Palmar and plantar keratosis and dermal calcinosis
- d. Ophthalmologic complications:
 - i. Congenital blindness
 - ii. Hypertelorism with wide nasal bridge
- e. Neurological complications:
 - i. Mental retardation
 - ii. Ductal calcification
 - iii. Agenesis of corpus callosum
 - iv. Medulloblastomas
 - v. Congenital hydrocephalus
- f. Sexual anomalies:
 - i. Hypogonadism
 - ii. Ovarian tumor.

LARSEN'S SYNDROME

Autosomal dominant disorder characterized by:

- a. Prominent forehead
- b. Frontal bossing
- c. Flattened midface

- d. Depressed nasal bridge
- e. Hypertelorism
- f. Bilateral displacement of tibia or femur with displaced platella
- g. Oral features:
 - i. Cleft palate
 - ii. Malocclusion.

LONG FACE SYNDROME (VERTICAL MAXILLARY EXCESS)

One of the skeletal dentofacial deformities.

The facial features are:

1. Increased height of lower third of face
2. Recessive paranasal areas
3. Narrow alar base
4. Prominence of infraorbital rim, cheek bones, prominent nose
5. Large interlabial gap (more than 4 mm)
6. Excessive incisor display—typical gummy smile
7. Retropositioned or recessive chin
8. Steep mandibular plane.

The dental features are:

1. An angle class II molar occlusion
2. A high arched palate
3. V-shaped maxillary dental arch
4. Accentuated curve of Spee
5. Two variants:
 - a. With anterior open bite.
 - b. Without anterior open bite.

MARFAN'S SYNDROME

Characterized by:

- a. Oral features:

- i. TMJ dysarthrosis
 - ii. Multiple odontogenic cysts of the maxilla and mandible
 - iii. High arched palate
- b. Skeletal anomalies—excessive length of tubular bone resulting in disproportionate long, thin extremities
- c. Craniofacial anomalies:
 - i. Skull and face are long and narrow
 - ii. Large ears
 - iii. Eyes appear sunken
 - iv. Frontal bossing
- d. Ocular anomaly—ocular lens subluxation
- e. Cardiovascular—aortic aneurysm.

MOEBIUS SYNDROME/CONGENITAL FACIAL DYSPLASIA

Characterized by:

- a. Partial or complete facial paralysis resulting is no change in facial expressions while *crying or laughing*
- b. Drooling of saliva
- c. Difficulty in mastication
- d. External ophthalmoplagia
- e. Deformity of external ears and deafness
- f. Pectoral muscle defect
- g. Paresis of tongue, soft palate, or jaw muscles
- h. Club foot
- i. Mental defect
- j. Epilepsy
- k. In infancy—failure to close the eyes during sleep.

MYOFASCIAL PAIN DYSFUNCTION SYNDROME

Characterized by:

- a. Pain in the muscle

- b. Tenderness of masticatory muscles
- c. Clicking or propping noise in TMJ
- d. Limitation of jaw movement or motion.

MELKERSSON-ROSENTHAL SYNDROME

It is a triad of:

- a. Facial paralysis
- b. Scrotal tongue
- c. Cheilitis granulomatosa.

MEDIAN CLEFT FACE SYNDROME OR FRONTAL NASAL DYSPLASIA

Characterized by:

- a. Nasal clefts and notches
- b. Preauricular tags
- c. Ocular hypertelorism
- d. Median cleft of premaxilla and palate
- e. Malocclusion.

MOHR'S SYNDROME

It is an autosomal recessive disorder characterized by:
Several oral-facial-digital defect.

The affected individual is moderately short.

- a. Oral Features:
 - i. High arched palate
 - ii. Lobate tongue
 - iii. Hypoplastic body of mandible
 - iv. Hypodontia
- b. Facial deformities:
 - i. Midline cleft lip
 - ii. Bifid tip of nose
- c. Digital deformities:
 - i. Brachydactyly

- ii. Syndactyly or polydactyly.

McCUNE-ALBRIGHT'S SYNDROME

Characterized by:

- a. Polyostotic fibrous dysplasia
- b. Skin pigmentation
- c. Endocrine abnormalities
- d. Precocious sexual development
- e. Early onset of puberty in female is common.

NAGAR'S SYNDROME OR ACROFACIAL DYSOSTOSIS

Characterized by:

- a. Facial features:
 - i. Hypoplasia of malar bone
 - ii. Antimongoloid obliquity or oblique palpebral fissures
 - iii. Absent eyelashes
 - iv. Deformed ears
 - v. Defective hearing
 - vi. Syndactyly
- b. Abnormalities of humerus and radius
- c. Oral features:
 - i. Cleft palate
 - ii. Micrognathism
 - iii. Malocclusion.

OROFACIAL DIGITAL SYNDROME

It is an X-linked condition which is exclusively found in females.

- a. Oral features:
 - i. Cleft tongue
 - ii. Cleft of alveolar process (mandibular)

- iii. Cleft lip
- iv. Thick fibrous bands in the lower mucobuccal fold eliminating the sulcus
- v. Supernumerary canine and premolars
- vi. Malpositioned teeth
- b. Facial features:
 - i. Frontal bossing
 - ii. Hypoplasia of alar cartilage
 - iii. Broad nasal root
 - iv. Ocular hypertelorism
- c. Digital malformation:
 - i. Clinodactyly
 - ii. Syndactyly
 - iii. Brachydactyly
 - iv. Polydactyly.

OROMANDIBULAR LIMB HYPOGENESIS SYNDROME

Characterized by:

- a. Oral features:
 - i. Cleft palate
 - ii. Ankyloglossia
 - iii. Micrognathia
 - iv. Microstomia
 - v. Hypoglossia
 - vi. Conical shaped mandibular incisors
- b. Ocular hypotelorism
- c. Cranial nerve palsy
- d. Hypodactyly of hands and feet.

OTO-PALATO-DIGITAL SYNDROME

Oto-palato-digital (OPD) syndrome characterized by:

- a. Facial features:

- i. Prominent supraorbital ridge
 - ii. Apparent hypertelorism
 - iii. Frontal bossing
- b. Oral features:
 - i. Cleft palate
 - ii. Micrognathia of mandible.

ORBITAL SYNDROME

The orbital injury may produce:

- i. Proptosis
- ii. Blindness—due to transverse fracture of the middle third of facial skeleton. The impingement, laceration or hemorrhage of the nerve sheath of the optic nerve may produce blindness.

POSTEXTRACTION SYNDROME (OSTEOMYELITIS SYNDROME OR DRY SOCKET)

One of the postextraction complications on the third or fourth day after tooth extraction.

Characterized by:

- a. Severe throbbing pain
- b. Foul smell (halitosis)
- c. No pus formation (no suppuration).

PLUMMER-VINSON SYNDROME

Characterized by:

- a. Cracks or fissures at the corner of mouth “angular cheilitis”
- b. Atrophy of filiform papillae
- c. Dysphagia due to esophageal webs
- d. Koilonychia.

PFEIFFER'S SYNDROME

Characterized by:

- a. Oral features:
 - i. Underdeveloped maxilla leading to mandibular prognathism
 - ii. High arched palate
 - iii. Bifid uvula
- b. Facial deformity:
 - i. Midface hypoplasia
 - ii. Shallow orbit
 - iii. Hypertelorism
 - iv. Proptosis
 - v. Antimongoloid obliquity
- c. Skeletal deformities:
 - i. Craniosynostosis with turribrachycephaly
 - ii. Broad thumb and halluces.

RAEDER'S SYNDROME OR PARATRIGEMINAL SYNDROME

Characterized by:

- a. Headache or pain in the area of distribution of trigeminal nerve
- b. Ocular sympathetic paralysis
- c. Weakness and paralysis of muscles of mastication.

RAMSAY HUNT'S SYNDROME

Characterized by:

- a. Facial paralysis.
- b. Pain of the external auditory meatus and pinna of the ear.
- c. Zoster infection of geniculate ganglion with involvement of external ear and oral mucosa.

- d. Vesicular eruption in the oral cavity and oropharynx with hoarseness, tinnitus and vertigo.

SJÖGREN'S SYNDROME

Characterized by:

- a. Primary:
 - i. Keratoconjunctivitis sicca
 - ii. Xerostomia
- b. Secondary:
 - i. Keratoconjunctivitis sicca
 - ii. Xerostomia
 - iii. Lupus erythematosus
 - iv. Polyarthrititis nodosa
 - v. Scleroderma
 - vi. Rheumatoid arthritis.

SUPERIOR ORBITAL FISSURE SYNDROME

It is attributed to poor reduction of LeFort III fracture or malunited zygomatic complex fracture.

Hematoma within the fissure affects 3rd, 4th, 5th cranial nerves. The optic nerve is not involved.

It may result in:

- i. Ophthalmoplagia
- ii. Proptosis
- iii. Retrobulbar pain.

STYLOID PROCESS SYNDROME

The elongated styloid process produces a variety of symptoms:

- a. Pain during swallowing
- b. Referred pain to the ear
- c. There is feeling of foreign body loaded in the ear
- d. The pain is increased on turning the head

- e. Elongated styloid process may cause irritation of the sympathetic nerves on the walls of the carotid artery and produces referred pain in their distribution.

SYNGNATHIA–POPLITEAL PTERYGIUM SYNDROME

It is one of the developmental defects characterized by:

- a. Paramedian lip pits
- b. Popliteal webbing (pterygia)
- c. Cleft lip or cleft palate
- d. Genital abnormalities
- e. Congenital bands connecting the upper and lower jaws (syngnathia).

SCHEUTHAUER–MARIE–SAINTON SYNDROME/ CLEIDOCRANIAL DYSPLASIA

Characterized by:

- a. Open fontanelle of skull.
- b. Partial or complete absence of clavicles.
- c. Underdeveloped maxilla.
- d. Multiple impacted or unerupted permanent or supernumerary teeth.

TRICHO-DENTO-OSSEOUS SYNDROME

It is transmitted as an autosomal dominant trait, characterized by:

- a. Hair and nail deformities:
 - i. Kinky hairs and nails
 - ii. Snow white bands and are also brittle
- b. Oral features:
 - i. Hypomaturation type amelogenesis imperfecta
 - ii. Enamel hypoplasia
 - iii. Unerupted teeth
 - iv. Taurodontism
- d. Facial features:
 - i. Obtuse mandibular angle

- ii. Square jaw.

TROTTER'S SYNDROME

Characterized by:

- a. Carcinoma of nasopharynx often producing trigeminal neuralgia like pain in the mandible, tongue and side of the head.
- b. Middle ear deafness.

TEMPOROMANDIBULAR JOINT DYSFUNCTION SYNDROME

Temporomandibular joint (TMJ) dysfunction may express itself as:

- a. TMJ arthritis
- b. Neurosis or neuritis

Characterized by:

Typical facial pain associated with:

- a. Myofascial dysfunction
- b. Masticatory muscle spasm producing:
 - i. Trismus
 - ii. Deviation of mandible
 - iii. Inability to occlude teeth
 - iv. Restriction in mandibular movement.
 - v. Pain over the TMJ that frequently radiates to the—
postauricular, submandibular, zygomatic, mastoid, occipital region.
- c. The joint is painful to palpation.
- d. The patient expresses associated emotional disturbances.

TREACHER COLLINS SYNDROME/ MANDIBULOFACIAL DYSOSTOSIS

Characterized by:

- a. Autosomal dominant trait

- b. Oral features:
 - i. Fish like mouth
 - ii. Macrostomia
 - iii. High arched palate
 - iv. Malocclusion
 - v. Pronounced concavity of under surface of mandible.
 - vi. Obtuse manibular angle.
- c. Facial features:
 - i. Downward sloping of the palpebral fissures (antimongoloid obliquity)
 - ii. Underdeveloped cheek bone
 - iii. Receding chin
 - iv. Malformation of external ear
 - v. Hypoplasia of bones especially malar bone and mandible
 - vi. Blind fistulae between angle of mouth and angle of ear
 - vii. Facial clefts
- d. Skeletal deformities.

VAN der WOUDE'S SYNDROME

Characterized by:

- a. Occurrence of pits of lower lip
- b. Presence of cleft lip and cleft palate.

WHISTLING FACE SYNDROME/CRANIO-CARPALOTARSAL SYNDROME

Characterized by:

- a. Sunken eyes
- b. True ocular hypertelorism
- c. Antimongoloid obliquity of palpebral fissures
- d. Small nose
- e. Microstomia

- f. High skull
- g. Protruding lips as seen during whistling
- h. High arched palate
- i. Mandible is small and retrognathic
- j. There is presence of fibrous bands demarcated by two grooves extending from midline of the lower to the chin often presenting 'H' or 'V' shape.

XXXXY SYNDROME

Characterized by:

- a. Hypoplastic midface
- b. Short stature
- c. Mental retardation
- d. Speckled eye
- e. Hypertelorism
- f. Oral features:
 - i. Taurodontism
 - ii. Bifid uvula.

ZYGOMATIC SYNDROME

Characterized by:

- a. Facial deformity in the form of flatness of cheek.
- b. Constant pain due to impingement of the coronoid process on opening the mouth.

Chapter

7

Diagnostic Clinical Signs in Maxillofacial Region

Chapter Outline

- Ball in Hand Configuration
- Beaten Silver Appearance of Skull
- Bull's Eye Ring or Tram Line Pattern
- Bucket Handle Appearance
- Battle's Sign
- Bell's Phenomenon or Bell's Sign
- Bird Face Appearance
- Birn Hypothesis or Dry Socket/Postextraction Syndrome
- Brudzinski's Sign
- Champy's Principle
- Crow's Foot Skin Creases
- Cherry Blossom Appearance
- Circle of Willis
- Coleman's Sign
- Commando Operation
- Cracked Pot Sound
- Crocodile Tear/Crocodile Tear Syndrome
- Carotid Siphon
- Dish-shaped Face/Dish Pan Face
- Difficulty Index
- Dog Ear Wound Closure
- Danger Area of the Face
- Epstein's Pearls
- Elephant Foot Deformity
- Frozen or Mask Like Face
- Facelift Surgery (Rhytidectomy)
- Golden Hour

Contd...

Contd...

- Goose Foot (Parotid Plexus or Pes Anserinus)
- Greenstick Fracture
- Guenerian Sign
- Glasgow Coma Scale
- Hilton's Law
- Hooding of the Eyes
- Jug Handle View
- Kiesselbach's Plexus or Little's Area
- Langer's Line
- Levine Sign
- Lincoln Highway of Neck
- Millard's Rule of 10
- Modiolus
- Open Sky Incision
- Pinto Ligament
- Pruned Tree Appearance or String of Sausages
- Peau D' Orange Skin
- Pott's Puffy Tumor
- Panda Facies or Moon Facies
- Parade Ground Fracture
- Raccoon Eyes or Raccoon Sign
- Slob Rule (Clark's Tube Shift Technique)
- Tongue Tie
- Tinel's Sign
- Thomas Principle
- Vossius Ring
- Whiplash View
- Water's View
- War Lines
- Witch's Chin
- White Strawberry Tongue and Red Strawberry Tongue
- Wry Neck
- Wrinkle Line or Natural Line
- Wolff's Law

BALL IN HAND CONFIGURATION

One of the type of sialographic picture.

Seen in the case of *sialosis*. The contrast media collects as ball in hand configuration.

BEATEN SILVER APPEARANCE OF SKULL

Radiographic examination of a case of head injury with raised intracranial tension is represented by beaten silver appearance of skull.

It calls for immediate attention.

Patient should be given IV mannitol and 10 percent dextrose with other medicines.

BULL'S EYE RING OR TRAM LINE PATTERN

In case of facial trauma, cerebrospinal fluid (CSF) rhinorrhea, septal hematoma occur.

The CSF is usually associated with bleeding, however the presence of CSF in the blood can be detected with the help of a simple test in which a drop of fluid is on a handkerchief and a classic bull's eye ring develops. It is also identified by the Tram Line Pattern.

BUCKET HANDLE APPEARANCE

Fracture of the edentulous mandible causes extreme downward and backward displacement of the mandible causing a bucket handle appearance.

BATTLE'S SIGN

Ecchymosis of the skin below the mastoid process (behind the ear) is known as Battle's sign.

It indicates unilateral condylar fracture of the same side.

This physical sign is also seen in fractures of the 'base of the skull' involving middle cranial fossa.

BELL'S PHENOMENON OR BELL'S SIGN

Bell's palsy is one of the facial nerve disorder.

Bell's phenomenon can be defined as an idiopathic paresis or paralysis of the facial nerve. In an attempt to close

the eyelid, the eyeball rolls upwards so that the pupil is covered and only the white sclera is visible.

BIRD FACE APPEARANCE

A child with bilateral bony temporomandibular joint (TMJ) ankylosis develops a typical 'bird face' appearance with a retruded chin as the growth of the mandible suffers extensively.

BIRN HYPOTHESIS OR DRY SOCKET/POST-EXTRACTION SYNDROME

It is a postextraction complication occurring on the 3rd or 4th day after extraction.

Is characterized by:

- a. Severe pain
- b. Foul smell
- c. No suppuration (pus formation)

Etiopathogenesis of dry socket which is universally accepted is the Birn's hypothesis or Birn's theories which are as follows:

- i. Fibrinolytic theory: Lab studies show increased activity of fibrinolytic agents in the extraction socket leading to lysis of the clot.
- ii. Bacterial theory: Existence of a high count of bacteria around the extraction site, e.g. *Actinomyces viscosus* and *Streptococcus mutans*.

BRUDZINSKI'S SIGN

Meningitis is one of the complications of odontogenic infection.

Clinically it debuts with intense headache, mental confusion, irritability, high fever with chills, vomiting and stiff neck (Brudzinski's sign). Convulsions may also occur.

CHAMPY'S PRINCIPLE

The miniplates are applied using the Champy's principle that states natural line of compression exists along the lower border of mandible.

If plates are applied along the border, then miniplates with self tapping monocortical screws applied on the outer cortical plates after reduction will be enough for proper fixation of fracture of mandible.

CROW'S FOOT SKIN CREASES

In case of frontozygomatic suture fracture—to expose the surgical site, the incision is made in the outer aspect of the eye in the 'crow's feet' skin creases.

CHERRY BLOSSOM APPEARANCE

One of the roentgenographic visualization of salivary gland and their ductal system is known as sialography.

For example, in case of 'Sjögren's syndrome' there is uniform collection of contrast media which resembles a tree laden with cherries which is called as Cherry Blossom appearance.

CIRCLE OF WILLIS

It is formed at the base of the brain by interconnection of vertebrobasilar and internal carotid system of vessels. This is accomplished by:

- i. An anterior communicating artery connecting the left and right anterior cerebral arteries to each other.
- ii. Two posterior communicating arteries one on each side connecting the internal carotid artery with the posterior cerebral artery.

COLEMAN'S SIGN

Submucosal extravasation of blood, particularly on the lingual side is, often indicative of an underlying fracture. Sublingual hematoma is also known as Coleman's sign, suggestive of fracture.

COMMANDO OPERATION

In case of management of carcinoma of head and neck region, regional lymph node dissection of neck and radical neck dissection is done and is commonly known as Commando operation.

CRACKED POT SOUND

In case of LeFort I fracture—percussion of the maxillary teeth produce sound similar to the sound when a cracked China clay pot is tapped with a spoon. Hence called so.

CROCODILE TEAR/CROCODILE TEAR SYNDROME

Due to injury to the facial nerve proximal to the geniculate ganglion.

Injury may misdirect the facial nerve fibers to the lacrimal gland, through the greater petrosal nerve (normally the fibers of the facial nerve go to the submandibular gland).

As a result the patient lacrimates while eating. This paroxysmal lacrimation is known as Crocodile tear syndrome or Crocodile tear.

Treatment: It can be treated by dividing the greater petrosal nerve.

CAROTID SIPHON

Carotid siphon a portion of the internal carotid artery running through the cavernous sinus called siphon because of its shape.

Tortuous segment of the internal carotid artery (ICA) extending from the carotid canal to the point of division of the carotid artery into the anterior cerebral artery (ACA) and middle cerebral artery (MCA).

DISH-SHAPED FACE/DISH PAN FACE

In case of LeFort II fracture (maxilla and middle third) there is gross downward and backward displacement of the fragments.

Elongation or lengthening of the face will be seen with posterior gagging of the occlusion and anterior open bite.

Lengthening of the face occurs due to separation of the middle third from the skull base.

DIFFICULTY INDEX

Impacted maxillary and mandibular 3rd molar are classified radiographically by angulation, depth and arch length or relationship to anterior aspect of the ascending mandibular ramus.

Classification is helpful in estimating difficulty in removing the tooth.

Difficulty Index

- Very difficult - 7 to 10
- Moderately difficult - 5 to 7
- Minimal difficult - 3 to 4

Table for difficulty index for removal of impacted 3rd molar.

<i>Classification</i>	<i>Difficulty index value</i>
A. Angulation	
I. Mesioangular	1 (easiest to remove)
II. Horizontal/transverse	2
III. Vertical	3
IV. Distoangular	4
B. Depth	
I. Position A	1

Contd...

Contd...

II. Position B	2
III. Position C	3
C. Ramus relationship/space available	
I. Class I	1
II. Class II	2
III. Class III	3
Difficulty index as follow:	
Distoangular impaction	4
Position B	2
Class II	2
Total	8

If the total score is eight, extraction is difficult.

DOG EAR WOUND CLOSURE

Wound closure should follow examination, debridement and preparation of the wound margins. One should avoid creating dog ears at the end of the wound.

Dog ears may develop due to faulty suturing, then the sutures should be removed and reclosure done or the dog ear should be lifted with a tissue forcep and excised.

DANGER AREA OF THE FACE

Infections from the face can spread in a retrograde direction and cause thrombosis of the cavernous sinus.

This is specially likely to occur in the presence of infection in the upper lip and in the lower part of the nose.

Hence this area is called the Danger Area of the Face.

EPSTEIN'S PEARLS

Palatal cysts of the newborn.

Occurs along the median palatal raphe and presumably arise from epithelium entrapped along the line of fusion.

ELEPHANT FOOT DEFORMITY

In case of edentulous mandible fractures, many times nonunion of fracture is seen due to impaired blood supply or presence of infection.

Many times soft tissue entrapment is also found between the fracture and leading to nonunion in the radiograph this eburnation is seen as elephant foot deformity.

FROZEN OR MASK LIKE FACE

In case of trigeminal neuralgia—in case of extreme conditions patients stop all activities.

The patient will have a ‘motionless face’ looks like frozen or mask like face.

FACELIFT SURGERY (RHYTIDECTOMY)

Under the facial esthetic surgery.

Rhytides are skin folds, creases or wrinkles.

Rhytides can be referred to as coarse or fine depending on the depth and anatomic cause.

Rhytidectomy or removal of skin wrinkles is more commonly known as ‘facelift surgery’

This procedure rejuvenates sagging neck skin, jowls (e.g. sagging skin and fat posterior to the labiomental creases), nasolabial folds and cheek laxity.

Facelift surgery can result in an elevated cheek contour and refined mandibular neck line.

Numerous techniques are used for facelift. The most common technique uses a type of lazy-S incision from the temple, around the ear and into the hair line.

GOLDEN HOUR

In the management of maxillofacial injuries—the first peak is within seconds to minutes of surgery, the second peak is within first hour. The Golden hour is area of main concern ranges from third day to a week or later, may reflect management within the Golden hour.

GOOSE FOOT (PAROTID PLEXUS OR PES ANSERINUS)

Goose foot is the term for point where the branching of the facial nerve occurs (extratemporal), after it leaves the stylomastoid foramen. It is also known as parotid plexus. This division takes place within the parotid gland.

GREENSTICK FRACTURE

One of the type of mandibular fracture. These appear as cracks in the bone in which only one cortex of bone is fractured whereas, the other cortex is bent as a greenstick of a tree.

For example, the fractures of bone in children because it is soft and elastic in nature.

GUERIN SIGN

In case of LeFort III fracture ecchymosis or hematoma in the region of greater palatine foramen.

GLASGOW COMA SCALE

In general in case of maxillofacial injuries, to assess the patient's level of consciousness, the AVPU mnemonic can be used.

A = Alert

V = Response to vocal stimuli

P = Responds only to painful stimuli

U = Unresponsive

To exactly assess the consciousness level the Glasgow Coma Scale is used.

<i>Eye opening (E)</i>	<i>Score</i>
Spontaneous	4
To speech	3
To pain	2
Nil	1
<i>Best motor response (M)</i>	
Obeys commands	6
Localizes pain	5
Withdraws	4
Abnormal flexion	3
Extensor response	2
Nil	1
<i>Verbal response (V)</i>	
Well oriented	5
Confused conversation	4
Inappropriate words	3
Incomprehensible sounds	2
Nil	1

Glasgow coma score = E + M + V

Minimum score = 3

Maximum score = 15

HILTON'S LAW

Hilton's law states that nerve which supply a joint also innervate the muscle that move it.

HOODING OF THE EYES

Seen in case of LeFort III fracture.

The fracture passes above the Whitnall's tubercle and so the support of the Lockwood's suspensory ligament is lost. This results in hooding of the eye from the upper eyelid, once the initial edema resolves.

May be seen due to separation of the frontozygomatic suture.

JUG HANDLE VIEW

Also known as submentovertex view/full axial view. Mainly for zygomatic arch fracture, base of the skull, lateral wall of maxillary sinus, foramina at the base of the skull and sphenoidal air sinus, to visualize posterior wall of maxillary sinus and also the medial and lateral pterygoid plates.

KIESSELBACH'S PLEXUS OR LITTLE'S AREA

It is formed by the anastomosis of the anterior ethmoidal artery, superior labial and sphenopalatine arteries. They form a large capillary network called as the Little's area. It is the common site of bleeding from the nose or epistaxis.

LANGER'S LINES

The Langer's lines tend to run parallel with the skin creases which generally are perpendicular to the action of the underlying muscle.

Elective incisions should be made in or parallel to the lines of facial expression or natural skin lines where possible.

LEVINE SIGN

It is one of the symptoms of myocardial infarction.

It is characterized by patient as fist clenched over the sternum, describing discomfort.

LINCOLN HIGHWAY OF NECK

It is seen in case of infection in head and neck region.

Infections are easily disseminated either upwards through various foramina at the base of the skull, producing brain abscess, meningitis or sinus thrombosis; or downwards into the carotid sheath towards the mediastinum, a pathway which Mosher called "The Lincoln Highway".

MILLARD'S RULE OF 10

Three rule should be considered in cleft lip repair:

- i. Lip repair timing-at 10th week
- ii. Hemoglobin-10 gm%
- iii. Weight of patient-10 pounds

MODIOLUS

Around eight to nine muscles converge on each of the two angles of mouth and interlace here at a palpable nodular mass calles as the Modiolos.

OPEN SKY INCISION

One of the type of incision in case of nasal fracture 'H' shaped incision is given.

PINTO LIGAMENT

One of the ligamentous structures of the TMJ also known as "Mandibulomalleolar ligament".

Pinto and others described this hence also called as Pinto's ligament.

This ligamentous structure (fibroelastic tissue) was found to be connecting the neck and anterior process of malleus, to the middle posterior superior part of the capsule, the disc, and sphenomandibular ligament.

PRUNED TREE APPEARANCE OR STRING OF SAUSAGES

It is seen in case of "Sialoclochitis".

Collection of contrast media occurs in the form of sialoclochitis or string of sausages in sialography.

PEAU D' ORANGE SKIN

A peculiar edema of cutis.

Peau d' orange is often seen in carcinoma infiltrating to the skin.

POTT'S PUFFY TUMOR

It is a serious complication of bacterial frontal sinusitis.

It consists of a subperiosteal abscess and osteomyelitis of the frontal bone.

PANDA FACIES OR MOON FACIES

In case of LeFort II and III fracture of maxilla (middle third of facial skeleton).

Gross edema of the face within 24 to 48 hours. There is a gross edema of the middle third of the face known as Ballooning or Moon face. The edema sets within a short time of the injury.

PARADE GROUND FRACTURE

In case of parade ground fracture—midline mandible fracture and displaced bilateral subcondylar fracture.

When kinetic energy derived from the movement of the individual is expended up on a static object. This is exemplified by a fall during an epileptic fit or following a faint when the patient is unable to protect the face with an overstretched hand, as in the case of parade ground fracture.

RACCOON EYES OR RACCOON SIGN

It is seen in case of LeFort II and III fracture of maxilla. Bilateral circumorbital or periorbital ecchymosis and gross edema occur giving an appearance of “Raccoons eyes”.

Gross circumorbital edema will prevent eye opening.

SLOB RULE (CLARK’S TUBE SHIFT TECHNIQUE)

Slob (Same Side—Lingual, Opposite Side—Buccal)

Slob rule can be used to determine the exact location of the impacted canine.

If the impacted tooth seems to be moving towards the same side in which the tube is shifted, it is located on the lingual side.

If the impacted tooth seems to be moving in the opposite direction to which the tube is shifted, it is located on the buccal or labial side.

In this method two periapical radiographs are taken in usual manner, but while taking the second radiograph film is positioned in the same place but the tube or cone of the X-ray involved horizontally in anyone direction (either to right or left).

Principle: Due to changes in the horizontal direction while taking the second radiograph unerupted tooth seems to be moving of mesial or distal direction with respect to adjacent teeth the surrounding anatomical direction.

TONGUE TIE

It is also known as ankyloglossia.

It is one of the developmental soft tissue deformity. The patient is unable to move the tip of the tongue adequately and is unable to pronounce some words like P, Q, R, S due to thick, short, fibrous lingual frenum which restricts the movement of the tongue.

Managed by lingual frenectomy.

TINEL'S SIGN

After peripheral nerve transection.

The pain commonly burning type or shock like is a positive Tinel's sign. In this test tapping over the suspected neuromas produces sharp, shooting, electric shock like pain. Damage to the mandibular or lingual nerve after the third molar surgery is another source for neuroma formation.

THOMAS PRINCIPLE

In case of jaw fracture, employing a wire through the drill holes with a spiral spring like turbinatation that was tightened periodically. This technique was used in the 19th century for fixation of mandibular fracture by open reduction.

VOSSIUS RING

Seen in case of ophthalmic consequences of maxillofacial injury.

In serious cases the papillary margin is impacted upon the anterior surface of the lens to leave a pigmented ring known as "Vossius ring" deposited on the anterior lens capsule.

The presence of such ring indicates that the injury has been very severe and that the eye should be thoroughly examined for other pathology.

WHIPLASH INJURY

In case of soft tissue injuries—hyperextension injuries of the cervical spines that are not associated with fracture or dislocation constitute a large portion of soft tissue injury.

Flexion occurs with recoil however it is usually less forceful.

Some authors have referred to this injury pattern as whiplash injury.

WATER'S VIEW

Also known as PNS view, occipitomental view or 'hanging drop appearance'.

This view was described by Water and Waldron. Mainly for:

1. Any abnormalities related to maxillary sinus e.g. impacted tooth, cyst, tumor, malignancy, trauma.
2. Trauma to orbital rim.
3. Fracture of zygomatic complex except zygomatic arch.
4. Malar bone fracture.
5. To detect oroantral fistula.
6. Sinusitis.

WAR LINES

As a preoperative assessment—on the basis of radiographic interpretation (IOPAR).

Particularly depth and position of impacted mandibular third molar within the mandible described as George Winter's three imaginary lines commonly known as war lines.

These lines are:

White line: It indicates the relative depth of the 3rd molar.

Amber line: It represents the bone level covering the impacted tooth.

Red line: Indicates the amount of resistance and difficulty encountered during removal.

WITCH'S CHIN

In case of replacement of implant on the anterior mandible two incisions are popular:

1. Crestal
2. Vestibular.

In case of vestibular incision, in general 10 mm of mentalis muscle should be left to avoid chin laxity, otherwise known as witch's chin.

WHITE STRAWBERRY TONGUE AND RED STRAWBERRY TONGUE

In case of scarlet fever, during first few days, the dorsal surface of the tongue demonstrates a white coating through which only the fungiform papillae can be seen.

By the 4th or 5th day red strawberry tongue develops when the white coating desquamates to reveal an erythematous dorsal surface with hyperplastic fungiform papillae. Scarlet fever is a systemic infection produced by Group-A beta hemolytic streptococci. Most common in children 3 to 12 years.

WRY NECK

Wry neck or torticollis is a deformity in which the head is bent to one side and the chin point to the other side. This is a result of spasm or contracture of the muscle supplied by the spinal accessory nerve. For example, sternocleidomastoid and trapezius muscle.

WRINKLE LINE OR NATURAL LINE

These lines are different from Langer's lines which denote the collagen fiber direction within the dermis. Elective incision can be made in or parallel to the line of facial expression or natural skin line where possible.

WOLFF'S LAW

During remodeling the newly formed woven bone, which is somewhat random in organization, undergoes remodeling into the more familiar pattern of lamellar bone.

This is a slow process that progresses in accordance with Wolff's law.

Wolff's law states that a change in the functional state of bone causes structural or architectural change in the tissue through bioelectric field production.

Chapter

8

Typical Radiographic Picture in Different Conditions

Chapter Outline

- Antral Halo
- Ball in Hand
- Bush in Winter
- Balloon Like Appearance
- Beaten Silver Appearance
- Cotton Wool Appearance
- Cherry Blossom Appearance
- Codman's Triangle
- Candlestick Appearance
- Chalk-like Appearance
- Driven Snow Appearance
- Downward Bowing
- Eggshell Appearance
- Fly's Cyst
- Filling Defect
- Ground Glass Appearance
- Honey Comb Pattern
- Hair-on-End Appearance
- Hanging Drop Appearance (in Maxillary Sinus)
- Moth-Eaten Appearance
- Mass of Coral
- Mottled Appearance
- Orange Peel Appearance
- Onion Peel Appearance
- Pear-Shaped Appearance
- Pepper Pot Skull
- Pencil-Like Appearance

Contd...

Contd...

- Permeated Type Appearance
- Pressure Type Appearance
- Punched Out Appearance
- Sunray's Appearance
- Sunburst Appearance
- Sausage-Like Appearance
- Soap Bubble Appearance
- Step Ladder Pattern
- Snow Storm Appearance
- Sialectasis
- Sand-Like Appearance
- Salt and Pepper Appearance
- Scalloping Pattern (Margin)
- Spiked Appearance
- Sharpened Pencil or Mouthpiece of Flute
- Tree in Winter
- Tennis Racket Appearance
- Teeth Standing in Space or Floating Teeth
- Thumb Print

1. **Antral halo:** Acute sinusitis.
2. **Ball in hand:** Sialographic appearance in intrinsic benign tumor.
3. **Bush in winter:** Normal sialographic appearance of submandibular gland.
4. **Balloon like appearance:** Follicular cyst.
5. **Beaten silver appearance:** Crouzon's syndrome.
6. **Cotton wool appearance:** Paget's disease.
7. **Cherry blossom appearance:** Sialographic appearance in Sjögren's syndrome.
8. **Codman's triangle:** Osteogenic sarcoma.
9. **Candlestick appearance:** Progressive systemic sclerosis.
10. **Chalk-like appearance:** Pycnodysostosis, osteoporosis, hyperparathyroidism.
11. **Driven snow appearance:** Calcifying epithelial odontogenic cyst.

12. **Downward bowing:** Cemento-ossifying fibroma.
13. **Eggshell appearance:** Ameloblastoma, multilocular cyst.
14. **Fly's cyst:** Osteoarthritis.
15. **Filling defect:** Salivary gland tumor.
16. **Ground glass appearance:** Fibrous dysplasia, Paget's disease, ossifying fibroma, hyperparathyroidism.
17. **Honey comb pattern:** Central giant cell granuloma, calcifying epithelial odontogenic cyst, odontogenic myxoma.
18. **Hair-on-end appearance:** Sickle cell anemia, thalassemia.
19. **Hanging drop appearance (in maxillary sinus):** Blow out orbital fracture.
20. **Moth-eaten appearance:** Osteomyelitis, osteoradionecrosis, early stage of osteosarcoma, squamous cell carcinoma, leukemia, malignant lymphoma.
21. **Mass of coral:** Calcified lymph nodes.
22. **Mottled appearance:** Fibrous dysplasia, ossifying fibroma.
23. **Orange peel appearance:** Fibrous dysplasia.
24. **Onion peel appearance:** Chronic osteomyelitis, Ewing's sarcoma, eosinophilic granuloma.
25. **Pear-shaped appearance:** Globulomaxillary cyst.
26. **Pepper pot skull:** Hyperparathyroidism.
27. **Pencil-like Appearance:** Ameloblastoma, traumatic bone cyst, calcifying epithelial odontogenic cyst (CEOC).
28. **Permeated type appearance:** Carcinoma of gingiva, squamous cell carcinoma of maxilla.
29. **Pressure type appearance:** Squamous cell carcinoma of gingiva.
30. **Punched out appearance:** Multiple myeloma.
31. **Sunray's appearance:** Osteoblastoma, osteosarcoma.
32. **Sunburst appearance:** Osteosarcoma, hemangioma.

33. **Sausage-like appearance:** Sialographic appearance of sialodochitis, (ductal inflammation/infection).
34. **Soap bubble appearance:** Ameloblastoma, aneurysmal bone cyst (ABC), central hemangioma.
35. **Step ladder pattern:** Sickle cell anemia.
36. **Snow storm appearance:** Sialographic appearance of Sjögren's syndrome.
37. **Sialectasis:** Sialographic appearance of sialadenitis.
38. **Sand-like appearance:** Adenoameloblastoma, calcifying epithelial odontogenic cyst (CEOC), calcifying epithelial odontogenic tumor (CEOT).
39. **Salt and pepper appearance:** Hyperparathyroidism, aneurysmal bone cyst, giant cell granuloma.
40. **Scalloping pattern (Margins):** Dentigerous cyst, traumatic bone cyst, ABC, giant cell tumor.
41. **Spiked appearance:** Malignant histiocytoma, Burkett's tumor.
42. **Sharpened pencil or mouthpiece of flute:** Osteoarthritis of TMJ.
43. **Tree in winter:** Normal sialographic appearance of parotid gland.
44. **Tennis racket appearance:** Osteogenic myxoma.
45. **Teeth standing in space or floating teeth:** Histiocytosis-X, severe periodontitis, malignant lymphoma.
46. **Thumb print:** Fibrous dysplasia.

Chapter

9

Test in Oral and Maxillofacial Surgery

Chapter Outline

- Bangalore Test (Method) or Hot Fermentation Process
- Bowie-Dick Test
- Brown's Test
- Chick-Martin Test
- Conduction Test (Diagnostic Test for Facial Paralysis)
- Forced Duction Test
- Frey's Hair Test
- Handkerchief Test
- Hess Test
- Nose Blowing Test
- Paget's Test
- Riedel-Walker Test
- Schirmer's Test
- Starch Iodine Test
- Tobey-Ayer Test
- Tourniquet Test
- TST Test
- Valsalva Test

BANGALORE TEST (METHOD) OR HOT FERMENTATION PROCESS

Composting is one of the methods of disposal of infectious wastes.

Composting is a method of combined disposal of refuse and night soil or sludge.

Anaerobic method or hot fermentation process or Bangalore method is one of the method for composting.

It has been devised by Indian Council of Agricultural Research of Indian Institute of Science, Bengaluru, Karnataka, India.

It has been recommended as a satisfactory method of disposal of town wastage and night soil.

BOWIE–DICK TEST

One of the tests for efficiency of heat sterilization.

Autoclave tape is a tape printed with sensitive ink that undergoes a color change at a particular temperature. This test forms the basis of the Bowie-Dick test.

For high vacuum autoclaves, two pieces of strip are stuck on to a piece of square paper and placed in the middle of the test-pack. With the application of temperature of 134 degree centigrades for 3.5 min. There is a uniform development of bars throughout the length of the strip. This shows that the steam has passed freely and rapidly to the center of the load.

BROWN'S TEST

One of the tests for checking the efficiency of heat sterilization.

Ampules that contain a chemical indicator which changes its color from red through amber to green at a specific temperature.

CHICK–MARTIN TEST

Testing of disinfectants.

The disinfectant acts in the presence of organic matter. Various other modifications have been introduced but no test is entirely satisfactory.

$$\text{Phenol coefficient} = \frac{\text{Dilution of test disinfectant}}{\text{Dilution of phenol}}$$

CONDUCTION TEST (DIAGNOSTIC TEST FOR FACIAL PARALYSIS)

The facial nerve is maximally stimulated at the angle of the mandible when a recording electrode is placed in the frontalis or orbicularis muscles. Latency of the distal muscle potential is measured from onset of stimulus, first on the normal then on the abnormal side. If normal response is obtained only with a current twice the normal threshold, nerve conduction is said to be absent. The length of latency period suggests the nature of nerve injury—neurapraxia, axonotmesis or neurotmesis.

FORCED DUCION TEST

Diplopia (the perception of two images of a single object) can be checked by “Forced Duction Test” with the help of fine toothed dissecting forceps.

The insertion of the inferior rectus muscle is gently grasped enabling the globe to be forcibly rotated upwards and its freedom of movement is compared with opposite side.

FREY’S HAIR TEST

In case of trigeminal neuralgia Frey hairs will usually indicate a small area of hypoesthesia in the distribution of the involved division.

HANDKERCHIEF TEST

One of the test for confirmation of CSF rhinorrhea.

If the fluid collected on the handkerchief is truly CSF in origin there will be a homogeneous ring and no stiffening of material.

If the leakage is serum or mucus secretions there will be several rings and stiffening of the cloth.

HESS TEST

Test for degree of diplopia. Hess chart is used to measure the degree of diplopia.

The test helps in showing which extraocular muscle is not functioning. When done on every alternative day, the progress of diplopia can be monitored.

In this test dissimilar images are projected for each eye at 1 meter distance with the patient wearing a red or green goggle.

A red test object is held against a screen and the patient tries to indicate the position of the object by touching it with a green tipped wand. The result of his/her effort is charted when his/her head is held still and he/she moves his/her eyes from the primary positions to the horizontal right and left extremes of movements. This is repeated when looking above to the right and left. The equivalent lower positions are charted.

NOSE BLOWING TEST

One of the investigations to confirm the presence of fistula.

A cotton wisp is kept near the fistulous opening and the patient is asked to blow the nose with closed nostrils and open mouth.

In the presence of oroantral communication air will be heard passing through the defect and will displace the cotton wisp whereas any blood present will be seen to bubble.

PAGET'S TEST

For the fluctuation of swelling.

A solid swelling feels firmer at the center than at the periphery, while a fluid swelling feels softer at the center than at the periphery.

The test however is not absolutely reliable.

RIEDEL-WALKER TEST

For testing of disinfectants.

Suspensions containing equal number of typhoid bacilli are submitted to the actions of varying concentrations of phenol and the disinfectant to be tested.

This test does not reflect the natural conditions as the bacteria and the disinfectant react directly without any organic matter being present.

SCHIRMER'S TEST

For dry eyes in a patient with Sjögren's syndrome.

Filter paper is placed in the ocular fornix and observed for wetting to a certain distance within a specific time limit.

STARCH IODINE TEST

Frey's syndrome (gustatory sweating syndrome) can be objectively documented by performing the minor starch iodine test.

This involves painting the skin on the face with a solution of 3 gm of iodine, 20 gm of castor oil and 200 ml of absolute alcohol.

Once this solution dries the painted area is dusted with starch powder. The patient is then asked to chew a lemon slice for two minutes to produce a salivary response.

The area is affected by the Frey's syndrome will be documented by sweat which dissolves the starch powder and reacts with the iodine powder to produce dark blue black spots.

TOBEY–AYER TEST

In case of cavernous sinus thrombosis.

Thrombosis of the sinus can be confirmed by the Tobey-Ayer test.

This is performed by compressing the internal jugular vein with fingers.

On the side of the thrombosis there will be no rise in CSF pressure, measured by lumbar puncture. There will be a rise in pressure when the jugular is compressed on the normal side.

TOURNIQUET TEST

It is a crude test to study platelet and vascular function.

It is performed by placing a blood pressure cuff on the upper arm for 3 minutes between the patient's systolic and diastolic blood pressure.

A positive test shows more than 5 petechiae in males and 10 in females, on the forearm in a circle of 2.5 cm diameter. The test is positive in vitamin C deficiency and thrombocytopenic purpura.

TST TEST

Biological indicator, spore A contains paper with spores of bacteria, *Bacillus stearothermophilus* A TCC 7593 in plastic bags.

This is used to check the efficacy of sterilization.

VALSALVA TEST

Oroantral communication can be confirmed by observing postextraction socket, when the patients tries to exhale gently through nose, while their nostrils are pinched.

Chapter

10

Red Lesions of the Oral Cavity

1. **Angular cheilitis:** Erythematous crack at the corners of the mouth.
2. **Denture sore mouth/denture stomatitis:** Mucosal erythema of denture bearing tissue.
3. **Erythema migrans:** A benign inflammatory condition generally affecting the tongue.
4. **Erythematous candidiasis:** Includes—
 - a. Atrophic candidiasis—follows broad-spectrum antibiotic or steroid therapy.
 - b. Median rhomboid glossitis—erythema on the dorsum of the tongue in the midline.
5. **Erythroplakia/Erythroplasia:** A red patch that cannot be clinically or pathologically classified as any specific disease.
6. **Hemangioma:** A benign proliferation of blood vessels.
7. **Pernicious anemia:** A megaloblastic anemia due to a vitamin B₁₂ deficiency.
8. **Pharyngitis:** Bacterial infection of the pharynx.
9. **Scarlet fever:** A systemic infection that is an expansion of streptococcal tonsillitis.
10. **Thermal burn:** Scalding of the oral cavity.
11. **Tonsillitis:** Bacterial infection of tonsil.

Chapter

11

White Lesions of the Oral Cavity

1. **Actinic cheilosis:** A premalignant alteration of the lip mucosa.
2. **Chemical burn:** Damage to the oral mucosa due to a chemical.
3. **Cinnamon reaction (contact stomatitis):** An allergic reaction.
4. **Hairy leukoplakia:** A common mucosal alteration that is a characteristic lesion of HIV. It is also seen in Epstein-Barr virus infection.
5. **Iron deficiency anemia:** Blanching of the soft tissue structures of the oral cavity.
6. **Leukoedema:** A common normal variation of buccal mucosa.
7. **Leukoplakia:** A white patch or plug that cannot be characterized clinically or pathologically as any other disease (WHO).
8. **Lichen planus:** A chronic inflammatory disease of the skin and oral mucosa.
9. **Linea alba:** A common benign lesion of the buccal mucosa.
10. **Morsicatio buccarum:** Chronic cheek chewing.
11. **Nicotine stomatitis:** Keratosis of the hard palate due to thermal trauma.
12. **Pseudomembranous candidiasis:** An opportunistic fungal infection.

White plaques that can be rubbed off leaving behind erythematous mucosa.

13. **Tobacco pouch keratosis:** A precancerous lesion of the lower lip.

Chapter

12

Yellow Lesions of the Oral Cavity

1. **Fordyce's granules:** Ectopic sebaceous glands of the oral mucosa.
2. **Lipoma:** A benign tumor of fat.
3. **Oral lymphoepithelial cyst:** A developmental lesion of the oral mucosa.
4. **Superficial abscess/parulus/gum boil:** Soft tissue manifestation of periapical abscess.

Chapter

13

Blue/Black/Brown/ Purple Lesions

1. **Amalgam tattoo:** Discoloration of mucosa due to deposition of pigment under the mucosa.
2. **Eruption cyst:** Soft tissue variation of the dentigerous cyst.
3. **Hairy tongue:** Excessive accumulation of keratin on the filiform papilla of the tongue.
4. **Hemangioma:** A benign proliferation of blood vessels.
5. **Kaposi's sarcoma:** A malignant vascular neoplasm.
6. **Melanoma:** A malignant neoplasm of melanocytes.
7. **Melanotic macule:** A benign pigmented lesion.
8. **Mucocele:** An accumulation of mucus in the connective tissue.
9. **Ranula:** An accumulation of mucosa in the floor of the mouth.
10. **Salivary duct cyst:** An epithelium lined cavity arising from the tissue of salivary gland duct.
11. **Smoker's melanosis:** A benign melanin hyperpigmentation.
12. **Submucosal hemorrhage:** Brushing of oral mucosa.
13. **Varicosities:** Dilated tortuous veins.

Chapter

14

Ulcerative Lesions of the Oral Cavity

1. **Minor aphthous stomatitis:** Recurring lesions of the oral cavity.
2. **Primary herpetic gingivostomatitis:** Viral infection of the oral mucosa.
3. **Recurrent herpes labialis:** Reactivation of latent herpes virus.
4. **Traumatic ulcerations:** Ulcerations of the oral cavity.
5. **Varicella (chickenpox):** A highly contagious disease of children.

Chapter

15

Pericoronal Radiolucencies

1. Ameloblastoma
2. Calcifying epithelial odontogenic tumor
3. Calcifying odontogenic cyst
4. Dentigerous cyst
5. Envelopmental primordial cyst
6. Ewing's sarcoma
7. Extrafollicular dentigerous cyst
8. Follicular primordial cyst
9. Follicular space
10. Odontogenic carcinoma
11. Odontogenic fibroma
12. Odontogenic keratocyst (OKC)
13. Odontogenic myxoma
14. Odontoma in pericoronal location
15. Ossifying fibroma
16. Paradental cyst
17. Pseudotumor of hemophilia
18. Salivary gland tumor
19. Squamous cell carcinoma
20. Squamous odontogenic tumor
21. Unicystic ameloblastoma.

Chapter

16

Solitary Cyst-like Radiolucencies

1. Ameloblastoma
2. Aneurysmal bone cyst
3. Artifact
4. Benign nonodontogenic tumor
5. Calcifying odontogenic cyst
6. Cementifying fibroma
7. Cementinoma
8. Central fibroma
9. Central hemangioma of bone
10. Giant cell granuloma
11. Incisive canal cyst
12. Lipoma (intraosseous)
13. Mandibular foramen
14. Marrow space
15. Maxillary sinus
16. Median sigmoid foramen
17. Mid palatal cyst
18. Minor salivary gland tumor in bone
19. Myxoma
20. Odontogenic fibroma
21. Odontogenic keratocyst
22. Odontoma (early stage)
23. Oral pulse granuloma
24. Ossifying fibroma

25. Osteoblastoma (early stage)
26. Postextraction socket
27. Postoperative maxillary cyst
28. Primordial cyst
29. Residual cyst
30. Squamous odontogenic tumor
31. Traumatic bone cyst
32. Unicystic ameloblastoma.

Chapter

17

Multilocular Radiolucencies

1. Ameloblastoma
2. Aneurysmal bone cyst
3. Burkitt's lymphoma
4. Calcifying epithelial odontogenic tumor
5. Cementifying fibroma
6. Central adenoid cystic carcinoma
7. Central giant cell granuloma
8. Central giant cell tumor
9. Central giant cell tumor of hyperparathyroidism
10. Central mucoepidermoid carcinoma
11. Central nonodontogenic fibroma
12. Central odontogenic fibroma
13. Cherubism
14. Chondroma
15. Chondrosarcoma
16. Eosinophilic granuloma
17. Fibrous dysplasia
18. Immature odontoma
19. Multilocular cyst
20. Odontogenic keratocyst
21. Odontogenic myxoma
22. Ossifying fibroma
23. Osteomyelitis
24. Pseudotumor of hemophilia
25. Squamous odontogenic tumor.

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